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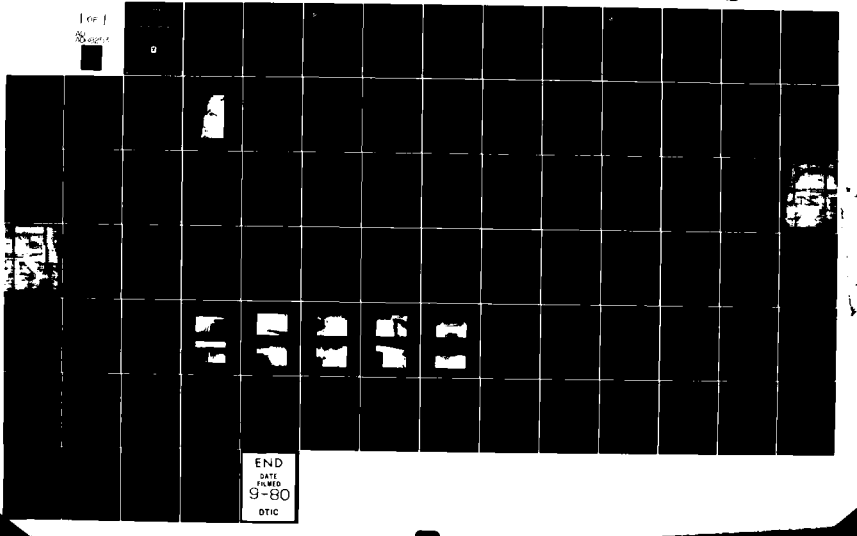

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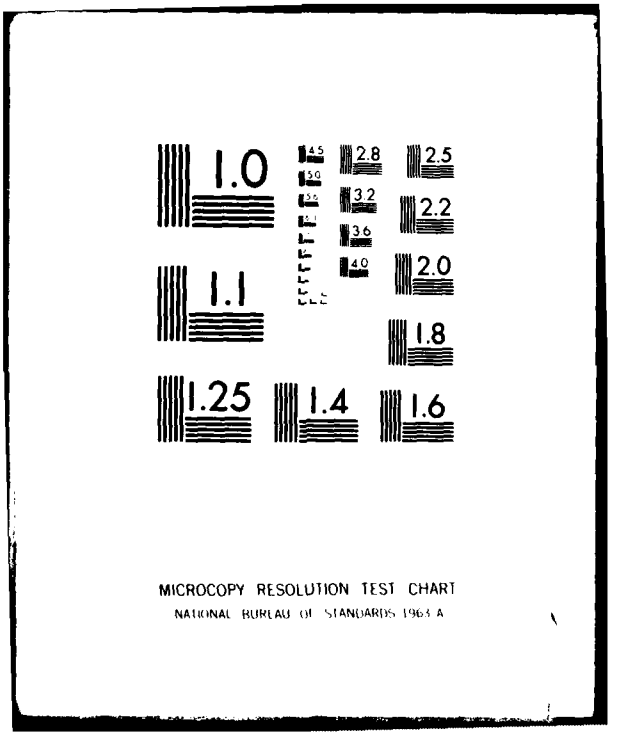
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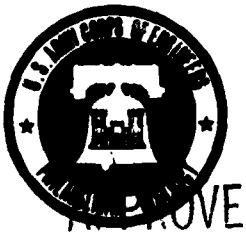
LEVEL II

PASSAIC RIVER BASIN
BELCHER'S CREEK, PASSAIC COUNTY
NEW JERSEY

PINECLIFF LAKE DAM
NJ 00012

AD A088253

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



DEPARTMENT OF THE ARMY

Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

ORIGINAL CONTAINS COLOR PLATES: ALL DDC REPRODUCTIONS WILL BE IN BLACK AND WHITE.

FEBRUARY 1980

FILE COPY

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

(10) John P. Talerico

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: NJ00012	2. GOVT ACCESSION NO.: AD-A088253
3. RECIPIENT'S CATALOG NUMBER:	
4. TITLE (and Subtitle): Phase I Inspection Report National Dam Safety Program, Pinecliff Lake Dam (NJ00012) Passaic River Basin Escher's Creek Passaic County, New Jersey. Phase I Inspection Report.	5. TYPE OF REPORT & PERIOD COVERED: (7) FINAL rept.
6. PERFORMING ORG. REPORT NUMBER:	
7. AUTHOR(s): [redacted]	8. CONTRACT OR GRANT NUMBER(s): (15) DACW61-79-C-0011
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Frederic R. Harris Inc. 453 Amboy Ave. Woodbridge, N.J. 07095	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
11. CONTROLLING OFFICE NAME AND ADDRESS: NJ Department of Environmental Protection ✓ Division of Water Resources P.O. Box CN029 Trenton, NJ 08625	12. REPORT DATE: (11) Feb 80
	13. NUMBER OF PAGES: 74
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): U.S. Army Engineer District, Philadelphia Custom House, 2d & Chestnut Streets Philadelphia, PA 19106 (12) 86	15. SECURITY CLASS. (of this report): Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams	National Dam Safety Program
Embankments	Pinecliff Lake Dam, New Jersey
Visual Inspection	Spillways
Structural Analysis	Seepage

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

11 AUG 1980

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Pinecliff Lake Dam in Passaic County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Pinecliff Lake Dam, a high hazard potential structure, is judged to be in fair overall condition. However, the spillway is considered seriously inadequate because a flow equivalent to seven percent of the Probable Maximum Flood (PMF) would cause the dam to be overtopped. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard of loss of life downstream from the dam. To ensure adequacy of the structure, the following actions, as a minimum, are recommended.

a. The owner should develop an emergency action plan outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam and establish a flood warning system for the downstream communities within three months from the date of approval of this report. Also, during periods of unusually heavy precipitation, around the clock surveillance should be provided.

b. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated.

c. The following remedial actions should be completed within twelve months from the date of approval of this report.

(1) All vegetation should be removed along the embankment toe in the observed wet areas to determine if the areas noted in the report are seepage areas. If seepage is present, then observation wells or piezometers should be installed in the embankment to determine the location of the phreatic surface and the paths of the seepage observed.

(2) The flow of seepage should be monitored monthly to determine its volume and whether it presents a problem to the safety of the dam.

(3) Repair all cracked and spalled concrete.

(4) All brush and trees should be removed from the downstream and upstream slopes to avoid problems which may develop from roots. The embankment face should then be seeded to develop a growth of grass for surface erosion protection.

(5) Remove all vegetation, debris and the large uprooted tree from the downstream channel.

(6) Remove all debris from the crest of the embankment.

(7) Replace broken manual controls for the sluice gate.

(8) Investigate the embankment for animal burrows and fill in any burrow holes with impervious material.

d. Consider providing additional low-level outlet facilities to decrease drawdown time.

e. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam within one year from the date of approval of this report.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Roe of the Eighth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

NAPEN-N
Honorable Brendan T. Byrne

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

PINECLIFF LAKE DAM (NJ00012)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 15 November and 5 December 1979 by Harris-ECI Associates, Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Pinecliff Lake Dam, a high hazard potential structure, is judged to be in fair overall condition. However, the spillway is considered seriously inadequate because a flow equivalent to seven percent of the Probable Maximum Flood (PMF) would cause the dam to be overtopped. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard of loss of life downstream from the dam. To ensure adequacy of the structure, the following actions, as a minimum, are recommended.

a. The owner should develop an emergency action plan outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam and establish a flood warning system for the downstream communities within three months from the date of approval of this report. Also, during periods of unusually heavy precipitation, around the clock surveillance should be provided.

b. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated.

c. The following remedial actions should be completed within twelve months from the date of approval of this report.

(1) All vegetation should be removed along the embankment toe in the observed wet areas to determine if the areas noted in the report are seepage areas. If seepage is present, then observation wells or piezometers should be installed in the embankment to determine the location of the phreatic surface and the paths of the seepage observed.

(2) The flow of seepage should be monitored monthly to determine its volume and whether it presents a problem to the safety of the dam.

(3) Repair all cracked and spalled concrete.

(4) All brush and trees should be removed from the downstream and upstream slopes to avoid problems which may develop from roots. The embankment face should then be seeded to develop a growth of grass for surface erosion protection.

(5) Remove all vegetation, debris and the large uprooted tree from the downstream channel.

(6) Remove all debris from the crest of the embankment.

(7) Replace broken manual controls for the sluice gate.

(8) Investigate the embankment for animal burrows and fill in any burrow holes with impervious material.

d. Consider providing additional low-level outlet facilities to decrease drawdown time.

e. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam within one year from the date of approval of this report.

APPROVED: James G. Ton
JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 8 Aug '80

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

19 JUN 1980

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

Dear Governor Byrne:

This is in reference to our ongoing National Program for Inspection of Non-Federal Dams within the State of New Jersey. Pinecliff Lake Dam (Federal I.D. No. NJ00012), a high hazard potential structure has recently been inspected. The dam is owned by the Pinecliff Lake Community Club, Inc., and is located on Belcher's Creek in West Milford.

Using Corps of Engineers screening criteria, it has been determined that the dam's spillway is seriously inadequate because a flow equivalent to seven percent of the Probable Maximum Flood would cause the dam to be overtopped. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise, or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard potential to loss of life downstream from the dam. As a result of this UNSAFE determination, it is recommended that the dam's owner take the following measures within 30 days of the date of this letter:

a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtopping of the dam.

b. In the interim, a detailed emergency operation plan and downstream warning system should be promptly developed. Also, around the clock surveillance should be provided during periods of unusually heavy precipitation.

A final report on this Phase I Inspection will be forwarded to you within two months.

Sincerely,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Copies Furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

UNSAFE DAM
NATIONAL PROGRAM OF INSPECTION OF DAMS

a. NAME: Pinecliff Lake Dam

b. ID NO.: NJ00012

c. LOCATION State: New Jersey, County: Passaic.
River or Stream: Belcher's Creek.
Nearest D/S City or Town: West Milford.

d. HEIGHT: 15 feet

e. MAXIMUM IMPOUNDMENT CAPACITY: 1,987 ac. ft.

f. TYPE: Earthfill.

g. OWNER: Pinecliff Lake Community Club, Inc.

h. DATE GOVERNOR NOTIFIED OF UNSAFE CONDITIONS: 19 June 1980

i. CONDITION OF DAM RESULTING IN UNSAFE ASSESSMENT: Preliminary report calculations indicate seven percent of the PMF would overtop the dam.

l. URGENCY CATEGORY: High Hazard, UNSAFE, Non-Emergency.

m. EMERGENCY ACTIONS TAKEN:
Gov. notified of this condition by District Engineer's letter of 19 June 1980

j. DESCRIPTION OF DANGER INVOLVED: High Hazard potential, overtopping and failure of the dam would significantly increase hazard potential to loss of life and property downstream of dam.

n. REMEDIAL ACTIONS TAKEN:
N.J.D.E.P. will notify dam's owner upon receipt of our letter.

k. RECOMMENDATIONS GIVEN TO GOVERNOR:
Within 30 days of the date of the District Engineer's letter the owner should do the following:
a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtopping of the dam.
b. In the interim, a detailed emergency operation plan and downstream warning system should be developed. Also, around-the-clock surveillance should be provided during periods of unusually heavy precipitation.

o. REMARKS: Final report, to be issued within six weeks, will have WHITE cover.

T.B. HEVERIN, Coordinator
Dam Inspection Program
U.S.A.E.D., Philadelphia

PASSAIC RIVER BASIN

BELCHER'S CREEK, PASSAIC COUNTY

NEW JERSEY

PINECLIFF LAKE DAM

NJ00012

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

DEPARTMENT OF THE ARMY

PHILADELPHIA DISTRICT, CORPS OF ENGINEERS

PHILADELPHIA, PENNSYLVANIA 19106

FEBRUARY 1980

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

Name:	Pinecliff Lake Dam, I.D. NJ 00012
State Located:	New Jersey
County Located:	Passaic County
Stream:	Belcher's Creek
River Basin:	Passaic River
Date of Inspection:	November 15 and December 5, 1979

Assessment of General Conditions

Pinecliff Lake Dam is an earthfill dam containing a broad crested slab and buttress concrete weir spillway 220 feet from the left end of the dam. The overall condition of the dam is fair. There is no major sign of distress or instability in the embankment. There are vertical cracks in both abutments. Leakage was noted from a crack in the downstream portion of the left abutment and from the construction joints with the first two left buttresses and the spillway slab. The downstream channel is cluttered with debris in the vicinity of the spillway. The operation of the low-level outlet was not demonstrated since the owner's representative was not present during the inspection. The hazard potential is rated as "high".

The adequacy of Pinecliff Lake Dam is considered questionable in view of its lack of spillway capacity to pass the SDF (PMF) without overtopping the dam. The spillway is capable of passing a flood equal to 6 percent of the PMF, and is assessed as "seriously inadequate".

At present, the engineering data available is not sufficient to make a definitive statement on the stability of the dam, but based on the findings of the visual inspection, the preliminary assessment of static stability is that it is satisfactory. The following actions are recommended along with a timetable for their completion. All recommended actions should be conducted under the supervision of an Engineer who is experienced in the design, construction and inspection of dams.

1. Carry out a more precise hydrologic and hydraulic analysis of the dam within twelve months, to determine the need and type of mitigating measures necessary. If required, conduct a study of the means of increasing spillway discharge capacity and develop alternative schemes for construction. This should include the installation of headwater and tailwater gages. The ability of the dam to withstand overtopping should also be studied.

2. All vegetation should be removed along the embankment toe in the observed wet areas to determine if the areas noted in the report are seepage areas. If seepage is present, then observation wells or piezometers should be installed in the embankment to determine the location of the phreatic surface and the paths of the seepage observed.

3. The flow of seepage should be monitored monthly to determine its volume and whether it presents a problem to the safety of the dam.

4. Repair all cracked and spalled concrete within twelve months.

5. All brush and trees should be removed from the downstream and upstream slopes to avoid problems which may develop from roots. The embankment face should then be seeded to develop a growth of grass for surface erosion protection. The program should be started within twelve months.

6. Remove all vegetation, debris and the large uprooted tree from the downstream channel within twelve months.

7. Remove all debris from the embankment crest within twelve months.

8. Replace the broken manual controls for the sluice gate within twelve months.

9. Investigate embankment for animal burrows and fill in any burrow holes with impervious material.

10. The owner should develop an emergency action plan (if one is not already available) outlining actions to be taken by the operator to minimize downstream effects of an emergency and establish a flood warning system for the downstream communities within three months.

Furthermore, while of a less urgent nature, the following additional action is recommended and should be carried out within twenty-four months.

1. Consider providing additional low-level outlet facilities to decrease the drawdown time.

2. The owner should develop within one (1) year after formal approval of the report, written operating procedures and a periodic maintenance plan to insure the safety of the dam.

John P. Talerico, P.E.

HARRIS-ECI ASSOCIATES

Photo taken January 21, 1980

P I N E C L I F F L A K E D A M

View looking toward left abutment and embankment.

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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APPENDICES

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

PINECLIFF LAKE DAM, I.D. NJ 00012

S E C T I O N 1

1. PROJECT INFORMATION

1.1 General

a. Authority

The National Dam Inspection Act (Public Law 92-367, 1972), provides for the National Inventory and Inspection Program by the U.S. Army Corps of Engineers. This inspection was made in accordance with this authority under Contract C-FPM No. 35 with the State of New Jersey who, in turn, is contracted to the Philadelphia District of the Corps of Engineers, and was carried out by the engineering firm of Harris-ECI Associates of Woodbridge, New Jersey.

b. Purpose of Inspection

The visual inspection of Pinecliff Lake Dam was made on November 15, 1979. The purpose of the inspection was to make a general assessment as to the structural integrity and operational adequacy of the dam embankment and its appurtenant structures.

c. Scope of Report

The report summarizes available pertinent data relating to the project; presents a summary of visual observations made during the field inspection; presents an evaluation of hydrologic and hydraulic conditions at the site; presents an evaluation as to the structural adequacy of the various project features; and assesses the general condition of the dam with respect to safety.

1.2 Description of the Project

a. Description of Dam and Appurtenances

Pinecliff Lake Dam is an earthfill dam approximately 820-foot long and 15-foot high with a concrete core wall. There is a 118-foot wide slab and buttress concrete spillway with two concrete abutments. There are eleven buttresses, one foot thick, equally spaced across the spillway. The left abutment of the spillway is 220 feet from the left end of the dam.

The crest of the spillway is 3 feet below the top of the dike. There are two 7-inch high flashboards spanning the spillway. The embankment has a top width of 8 feet with a 2H:1V slope on both faces.

Riprap protection has been placed on the upstream face of the embankment.

The low-level outlet consists of a 24-inch diameter sluice way through the right abutment. The flow through the sluice way is controlled by a manually operated sluice gate that is mounted on a steel bracket attached to the upstream face of the abutment. The inlet end is located at the upstream toe of the spillway. The outlet discharges directly into the spillway stilling basin.

The downstream channel runs almost perpendicular to the spillway and crosses under the Union Valley Road bridge approximately 300 feet from the dam.

The foundation of the dam is described as clayey hardpan according to test pits taken at the site prior to construction. A generalized description of the soil conditions is contained in Engineering Soil Survey of New Jersey, Report No. 3 - Passaic County, by Rutgers University. The report describes the area left of the spillway as stratified drift and to its right as ground moraine. The stream channel is described as swamp.

Stratified drift is an assorted relatively homogeneous material, predominantly of sand sizes, with varying amounts of silt and gravel. Ground moraine, in this area, is variable thicknesses of unstratified, heterogeneous material including clay, silt and sand sizes, with varying amounts of gravel and boulders. Left of the stream channel, the depth to the underlying rock is in excess of 10 to 20 feet and to its right the rock is shallow. The underlying rock is classified as Kanouse sandstone by the USGS Geologic Overlay Sheet 22.

b. Location

Pinecliff Lake Dam is located on Belcher's Creek in the Township of West Milford, Passaic County, New Jersey. It is accessible by way of Union Valley Road.

c. Size Classification

According to the "Recommended Guidelines for Safety Inspection of Dams" by the U.S. Department of the Army, Office of the Chief Engineers, the dam is classified in the dam size category as being "intermediate", since its storage volume of 1,987 acre-feet is more than 1,000 acre-feet, but less than 50,000 acre-feet. The dam is also classified as "small" because its height of 15.0 feet is less than 40 feet. The overall size classification is governed by the larger of these two determinations, and accordingly, Pinecliff Lake Dam is classified as "intermediate" in size.

d. Hazard Classification

A hazard potential classification of "high" has been assigned to the dam on the basis that a hypothetical failure would result in excessive damage to the small shopping center and Union Valley Road immediately downstream of the dam. Because the road is heavily traveled and there are several places of business (the small shopping center) situated on the far side of Union Valley Road along the right bank of the channel and are within the flood path, the possibility exists of the loss of more than a few lives in the event of dam failure.

e. Ownership

Pinecliff Lake Dam is owned by:

Pinecliff Lake Community Club, Inc.
P. O. Box
West Milford, NJ 07480

Attention: Mr. Steve Smith
(201) 728-9854

f. Purpose

Pinecliff Lake Dam is presently used for recreational purposes only.

g. Design and Construction History

Pinecliff Lake Dam was constructed in 1927. At that time, flashboards were placed on the spillway, but since they were not included in the original plans or approved by the State, they had to be removed. In 1930, the dam was modified to allow for the flashboards to be used. This was accomplished by raising the crest of the embankment one foot with a densely compacted clay material placed over the entire width of the embankment.

In August 1969, after 24 hours of very heavy rains, the safety of the dam was in question due to the increased runoff. In order to handle the flow, sandbags were placed on the crest to prevent overtopping. In a report submitted in October 1969, it was recommended that the flashboards be removed as they were probably the main cause of the spillway not being adequate to handle the flow.

h. Normal Operating Procedures

The discharge from the lake is unregulated and is allowed to naturally balance the inflow into the lake. The low-level outlet is used to lower the lake level for cleaning the lake bottom and to allow the property owners to make repairs to their docks and waterfront property.

1.3 Pertinent Data

a. Drainage Area	7.0 square miles
b. Discharge at Dam Site	
Ungated spillway capacity at elevation of top of dam:	940 cfs (638 NGVD)
Total spillway capacity at maximum pool elevation (SDF):	24,070 cfs (642.48 NGVD)
c. Elevation (Feet above NGVD)	
Top of dam:	638
Maximum pool design surcharge (SDF):	642.48
Recreation pool:	635.3
Spillway crest:	635.0; 636.2 (Flashboards)
Streambed at centerline of dam:	623 (estimated)
Maximum tailwater:	633 (estimated)
d. Reservoir	
Length of maximum pool:	6,000 ft. (estimated)
Length of recreation pool:	5,500 ft. (estimated)
e. Storage (acre-feet)	
Spillway Crest:	695
Top of Flashboards:	723
Top of Dam:	1,011
Maximum pool (SDF):	1,987
f. Reservoir Surface (acres)	
Top of dam:	181 (estimated)
Maximum pool (SDF):	273 (estimated)
Recreation pool:	N/A
Spillway crest: (Top of flashboard)	143 (estimated)

g. Dam

Type:	Earth fill slab and buttress concrete with flashboards
Length:	820 ft. (effective)
Height:	15 ft.
Top width:	8 ft.
Side slopes - Upstream:	2H:1V
- Downstream:	2H:1V
Zoning:	Unknown
Impervious core:	690 ft. concrete core
Cutoff:	None
Grout curtain:	None

h. Diversion and Regulating Tunnel

N/A

i. Spillway

Type:	Slab and buttress with flashboards
Length of weir:	118 ft.
Crest elevation:	635 (concrete weir), 636.2(flash-board)
Gates:	None
U/S Channel:	Pinecliff Lake
D/S Channel:	Belcher's Creek

j. Regulating Outlets

Low level outlet:	24-inch diameter sluice way
Controls:	Manually operated sluice gate
Emergency gate:	None
Outlet:	626 NGVD

SECTION 2

2. ENGINEERING DATA

2.1 Design

Drawings and specifications for the construction of Pinecliff Lake Dam in 1926 are available in the files of NJ Department of Environmental protection (NJ-DEP), in Trenton. No data from soil borings, soil tests, design computations, or other geotechnical data is available to assess the stability properly. Data concerning the hydraulic capacity of the spillway is also unavailable.

2.2 Construction

Data is not available concerning the as-built construction of the dam. Progress reports during the construction are on file at the NJ-DEP. No data exists of construction methods, borrow sources or other data pertinent to the construction of the dam.

2.3 Operation

Formal operation records are not kept for the dam and reservoir. The lake is allowed to operate naturally without regulation.

2.4 Evaluation

a. Availability

The availability of engineering data is fair. The construction plans and specifications for the dam are available from the NJ-DEP.

b. Adequacy

The engineering data available from the NJ-DEP and from the field was adequate to perform hydrologic and hydraulic computations. The data was insufficient to perform a stability analysis, but a preliminary evaluation could be made based on visual observations.

c. Validity

The information contained in the drawings and checked by limited field measurements appears to be valid.

SECTION 3

3. VISUAL INSPECTION

3.1 Findings

a. General

The visual inspection of Pinecliff Lake Dam revealed the dam and spillway to be in fair condition, but in need of repairs. The lake level was above the crest of the spillway at the time of the inspection.

b. Dam

The earth embankment appears to be sound. No surface cracking, sloughing or erosion was noted on the embankment or beyond the toe. The horizontal and vertical alignment of the crest was generally good. Refuse has been dumped in some areas of the left embankment. Some of this refuse consisted of concrete, concrete piping and metal piping. Numerous trees, small to large, are growing on both sides of the embankment. Small flow, either rainwater runoff or seepage has created a channel along most of the toe of the right embankment. The source of the flow could not be located. The source and the flow were inaccessible and obscured by dense vegetation. No seepage was observed along the left embankment, but beyond the toe the ground was very soggy and wet.

No evidence of burrowing by animals was discovered; however, at the time of the inspection, the embankment was covered with leaves, therefore the possiblility does exist that there may be burrow holes in the embankment.

c. Appurtenant Structures

1. Spillways

The spillway begins about 220 feet from the embankment's left end. Leakage was noticed at a downstream crack in the left abutment wall. Leakage was noticed at the joints of the first two buttress slabs at the left end of the spillway. Spalling was noticed at the downstream side of both abutment walls. It was severe on the left and minor on the right. Cracks were noted on the upstream side of both abutment walls - two cracks were on the left and one on the right. The top of the spillway appeared in good condition with no horizontal or vertical misalignment. Sluice boards, 14 inches high, spanned the spillway. The boards did not create any damming; they were raised off the spillway top by a series of blocks. Water flowed through the opening between the spillway and boards. There was no cracking or spalling of the concrete apron.

2. Outlet

The low-level outlet is a manually operated rising stem sluice gate. The outlet is a 24-inch diameter sluice way at the face of the right abutment underneath the spillway. It appears in good condition. Its outlet valve is mounted on a steel bracket attached to the right abutment. The valve stem and stand were observed to be in fair condition. The handwheel required to operate it is missing. Operation of the valve could not be performed because the owner/representative was not present. However, the owner stated that the valve could be satisfactorily operated but with difficulty.

d. Reservoir Area

The side slopes of the reservoir are moderate. There is no indication of slope instability. The water surface of the reservoir is clear with no vegetation.

e. Downstream Channel

The spillway flow passes into a flat and wide channel cluttered with assorted debris, vegetation and one large overturned tree. The condition of the channel improves further downstream. About 300 feet from the spillway, the channel passes under the Union Valley Road bridge. A bar business fronts the road to the channel's left and to its right there are numerous small businesses. All front the downstream portion of the road.

SECTION 4

4. OPERATIONAL PROCEDURES

4.1 Procedures

Pinecliff Lake Dam is used to impound water for recreational activities. The level of the lake is maintained through the unregulated flow over the spillway. The lake is lowered occasionally for cleaning the bottom and to allow property owners to make repairs to their properties.

4.2 Maintenance of the Dam

There is no regular inspection and maintenance program for the dam and appurtenant structures. The Pinecliff Lake Community Club, Inc. is responsible for the maintenance of the dam.

4.3 Maintenance of Operating Facilities

The low-level operating facilities consist of one manually operated 24-inch sluice gate. At the time of the inspection, the operation of the gate was not possible since the hand wheel was missing. However, the owner indicated that the gate is operable with some difficulty.

4.4 Evaluation

The present operational and maintenance procedures are fair with the dam and spillway being maintained in a serviceable condition.

SECTION 5

5. HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design

The drainage area above Pinecliff Lake Dam is approximately 5.85 square miles. A drainage map of the watershed of the dam site is presented on Plate 1, Appendix D.

The topography within the basin is flat to moderately sloped. Elevations range from approximately 1,300 feet above NGVD at the west part of the watershed to about 636 feet at the dam site. Land use patterns within the watershed are mostly woodland with concentrated residential development about the lake area.

The evaluation of the hydraulic and hydrologic features of Pinecliff Lake was based on criteria set forth in the Corps' guidelines and additional guidance provided by the Philadelphia District, Corps of Engineers. The SDF for the dam falls in a range of half PMF to PMF. In this case, the upper end of the range, PMF, is chosen since the factors used to select size and hazard classification are on the upper side of their respective ranges.

The probable maximum flood (PMF) was calculated from the probable maximum precipitation using Hydrometeorological Report No. 33 with standard reduction factors. Due to the small drainage area, the SCS triangular hydrograph transformed to a curvilinear hydrograph was adopted for developing the unit hydrograph, with the aid of the HEC-1-DB Flood Hydrograph Computer Program.

Initial and constant infiltration loss rates were applied to the Probable Maximum Precipitation to obtain rainfall excesses. The rainfall excesses were applied to the unit hydrograph to obtain the PMF and various ratios of PMF utilizing program HEC-1-DB.

The SDF peak outflow calculated for the dam is 24,070 cfs. This value is derived from the PMF, and results in overtopping of the dam, assuming that the lake was originally at the spillway crest elevation.

The stage-outflow relation for the spillway was determined from the geometry of the spillway and dam, utilizing HEC-1-DB program.

There is flow through the opening between the spillway crest and bottom of flashboards. This opening is usually plugged by debris. Therefore, the area between the spillway and board is not considered to be effective and this area is not included in development of the spillway rating curve.

The reservoir stage-storage capacity relationship was computed directly by the conic method, utilizing the HEC-1-DB program. The reservoir surface areas at various elevations were measured by planimeter from a USGS Quadrangle topographic map. Reservoir storage capacity included surcharge levels exceeding the top of the dam, and the spillway rating curve was based on the assumption that the dam remains intact during routing.

A breach analysis indicates that the stage of the stream below Union Valley Road is 5.5 feet higher due to dam failure from overtopping at 10 percent PMF than it would be without failure at 10 percent PMF. This is likely to jeopardize the well traveled road and the small shopping center downstream of the dam significantly more than without failure. The discharge facility is thus rated as "seriously inadequate"

Drawdown calculations indicate that to empty the lake to an elevation of 626 NGVD through the one low-level sluice would take 7 days with no inflow. This is considered to be an excessive drawdown period, and provision of additional outlets should be considered.

b. Experience Data

No records of reservoir stage or spillway discharge are maintained for this site.

c. Visual Observation

The spillway flow passes into a flat and wide channel cluttered with assorted debris, vegetation and one large overturned tree. The condition of the channel improves further downstream. About 300 feet from the spillway, the channel passes under the Union Valley Road bridge. A bar business fronts the road to the channel's left and, to its right, there are numerous small businesses. All front the downstream portion of the road.

The slopes of the reservoir are moderate and do not exhibit signs of instability. The drainage area is wooded, moderately flat sloped and developed for residential use around the lake.

d. Overtopping Potential

A storm of magnitude equivalent to the SDF would cause overtopping of the dam to a height of 4.48 feet. Computations indicate that the dam can pass approximately 6 percent of the PMF without overtopping the dam crest. Since the PMF is the Spillway Design Flood (SDF) for this dam, according to the Recommended Guidelines for Safety Inspection of Dams by the Corps of Engineers, the spillway capacity of the dam is assessed as "seriously inadequate".

SECTION 6

6. STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

There are no major signs of distress in the embankment of the Pinecliff Lake Dam. Aside from minor crest distortions of the left embankment due to random dumping, the alignment of the crest was good. Trees growing on both sides of the embankment could pose a threat to stability. Either rainwater or seepage flow was observed along most of the toe of the right embankment. Also, the ground beyond the toe of the left embankment was soggy and wet. If the flow and sogginess are caused by seepage instead of rainwater, this could cause piping and eventual failure.

The spillway is in fair condition. Leakage was noticed at a downstream crack in the left abutment and in the two adjoining buttress slabs. Spalling was noted on the downstream side of both abutments. There are cracks on the upstream portion of both abutments.

b. Design and Construction Data

No design computations relating to stability were uncovered during the report preparation phase. No embankment or foundation soil parameters are available for carrying out a conventional stability analysis on the embankment.

c. Operating Records

No operating records are available relating to the stability of the dam.

d. Post-Construction Changes

The crest of the embankment was raised one foot in 1930 to allow for the use of flashboards.

e. Static Stability

A static stability analysis was not performed on the Pinecliff Lake Dam because the lack of data on which to base assumptions of materials properties inside embankment zones might produce misleading results, but based on the findings of the visual inspection, the preliminary assessment of static stability is that it is satisfactory.

f. Seismic Stability

The dam is located in Seismic Zone 1, as defined in the Recommended Guidelines for Safety Inspection of Dams, prepared by the Corps of Engineers. In general, projects located in Seismic Zones 0, 1 and 2 may be assumed to present no hazard from earthquake, provided the static stability conditions are satisfactory and conventional safety margins exist, and based on the findings of the visual inspection, the preliminary assessment of the static and seismic stabilities is that they are satisfactory.

SECTION 7

7. ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety

The dam has been inspected visually and a review has been made of the available engineering data. This assessment is subject to the limitations inherent in the visual inspection procedures stipulated by the Corps of Engineers for a Phase I report.

The safety of Pinecliff Lake is in question because the dam does not have adequate spillway capacity to pass the SDF (PMF) without overtopping. Overtopping of the dam carries with it the danger of possible progressive failure of the dam. The present spillway capacity of the dam is approximately 6 percent of the PMF.

No definitive statement pertaining to the safety of the embankment can be made without acquisition of embankment meterial engineering properties and determination of phreatic levels in the downstream part of the embankment, but based on the findings of the visual inspection, the preliminary assessment of static stability is that it is satisfactory.

b. Adequacy of Information

The information uncovered was adequate to perform hydrologic and hydraulic computations. The data was insufficient to perform even an approximate computation of the stability of the dam. A preliminary assessment of the dam could be made by visual observation only.

c. Urgency

Carry out a more precise hydrologic and hydraulic analysis of the dam within twelve months, to determine the need and type of mitigating measures necessary. If required, conduct a study of the means of increasing spillway discharge capacity and develop alternatives schemes for construction. This should include the installation of headwater and tailwater gages. The ability of the dam to withstand overtopping should also be studied.

All vegetation should be removed along the embankment toe in the observed wet areas to determine if the areas noted in the report are seepage areas, and if they are, then observation wells or piezometers should be installed in the embankment to determine the location of the phreatic surface and the paths of the seepage observed. This should be done within twelve months.

The flow of seepage should be monitored monthly to determine its volume and whether it presents a problem to the safety of the dam.

The existing dam plans and drawings should be annotated and updated to form a coherent as-built set within twelve months.

7.2 Remedial Measures

a. Alternatives for Increasing Spillway Capacity

Alternatives for increasing spillway capacity are as follows:

1. Increase the embankment height of the dam thus permitting a higher discharge to pass over the spillway and reducing the possibility of overtopping.

2. Lower the spillway crest elevation.

3. Increase the spillway crest length.

4. A combination of any of the above alternatives.

b. Recommendations

1. Repair all cracked and spalled concrete within twelve months.

2. All brush and trees should be removed from the downstream and upstream slopes to avoid problems which may develop from roots. The embankment face should then be seeded to develop a growth of grass for surface erosion protection. This program should be started within twelve months.

3. Remove all vegetation, debris and the large uprooted tree from the downstream channel within twelve months.

4. Remove all debris from the crest of the embankment within twelve months.

5. Replace broken manual controls for the sluice gate within twelve months.

6. Investigate embankment for animal burrows and fill in any burrow holes with impervious material.

The following additional actions are recommended:

1. The owner should develop an emergency action plan (if one is not already available) outligning actions to be taken by the operator to minimize downstream effects of an emergency and establish a flood warning system for the downstream communities within three months.

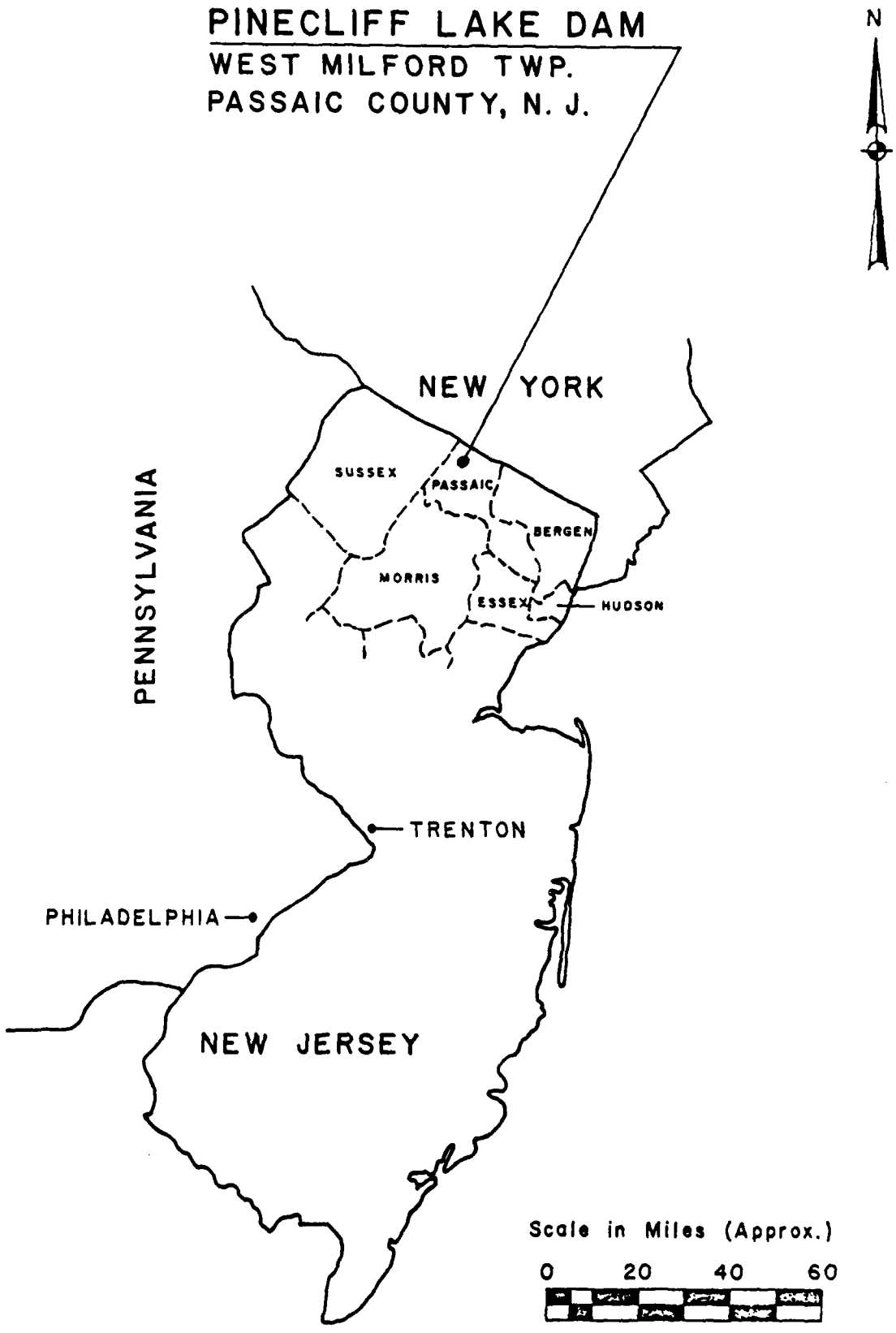
2. Consider providing additional low-level outlet facilities to decrease the drawdown time.

c. O & M Procedures

The owner should develop, within one (1) year after formal approval of the report, written operating procedures and a periodic maintenance plan to insure the safety of the dam.

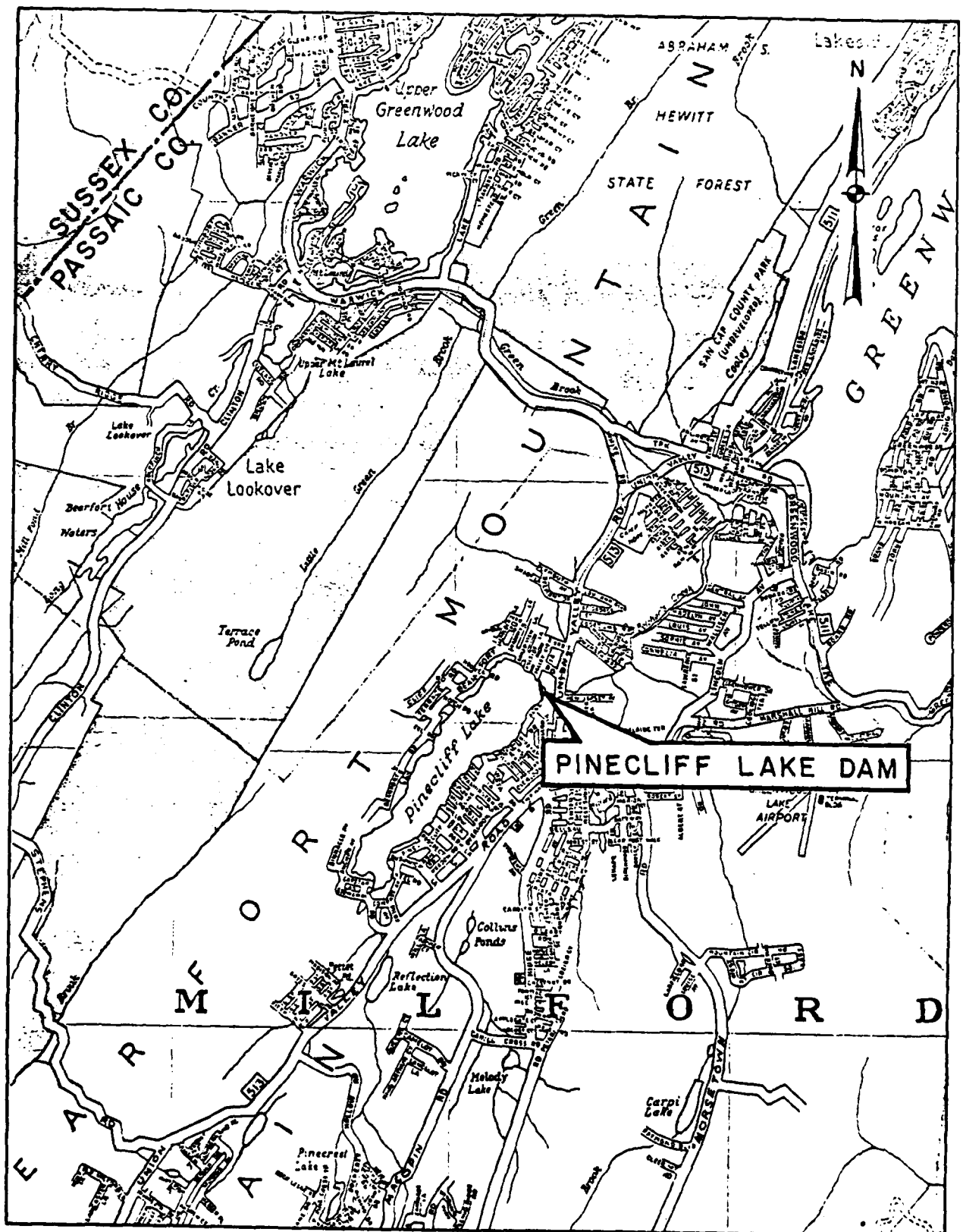
PLATES

PINECLIFF LAKE DAM
WEST MILFORD TWP.
PASSAIC COUNTY, N. J.



KEY MAP

PLATE 1

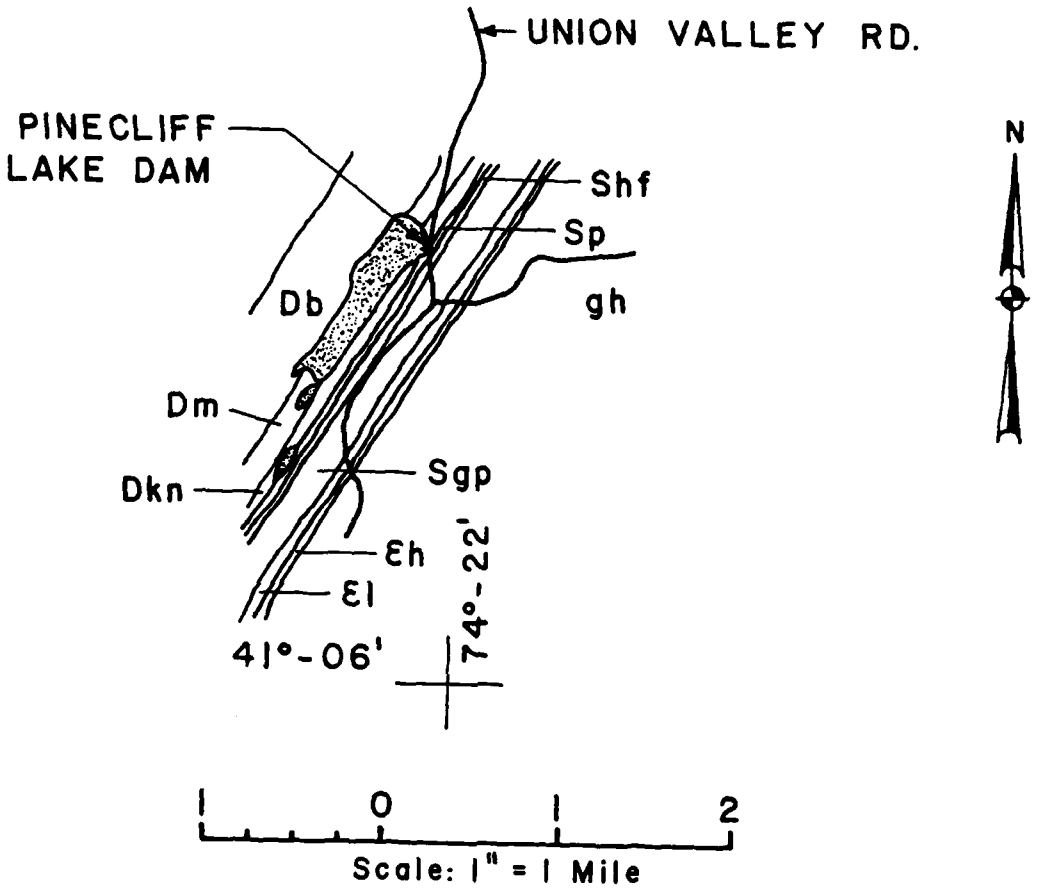


Scale in Feet (Approx.)

2,000 0 2,000 4,000 6,000 8,000 10,000

VICINITY MAP

PLATE IA

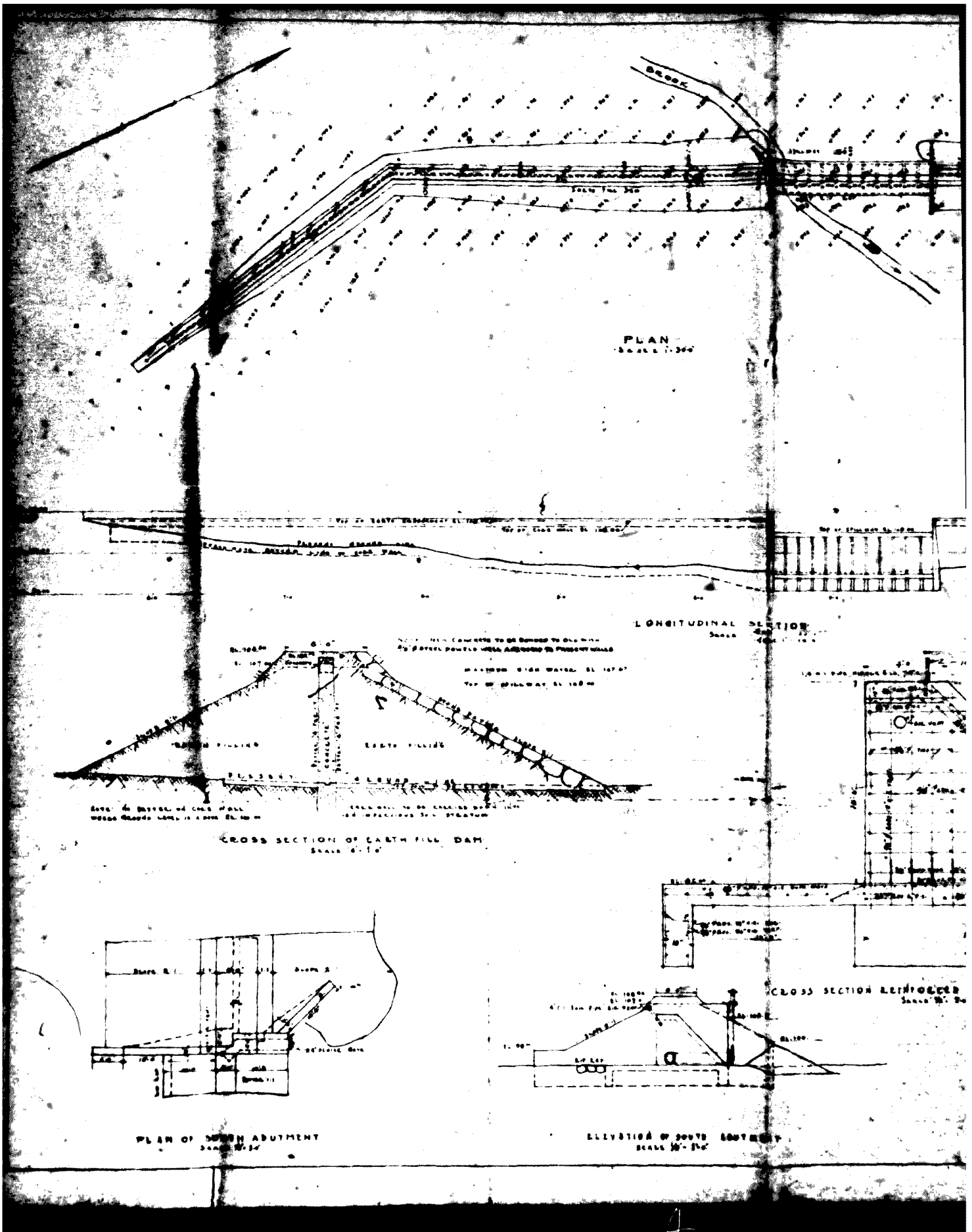


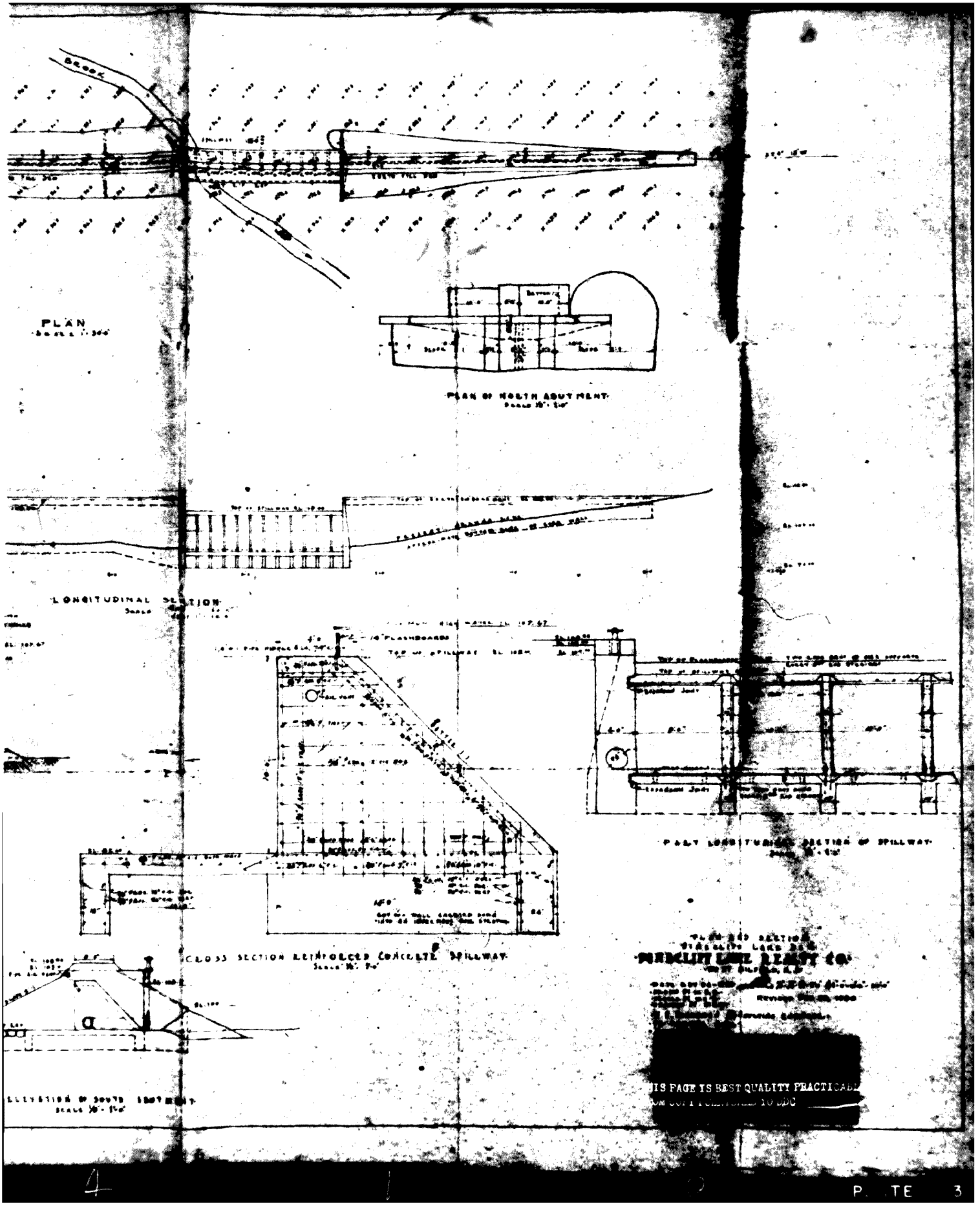
LEGEND:

	DEVONIAN		CAMBRIAN
Db	Bellvale Sandstone	εh	Hardyston Sandstone
Dkn	Kanouse Sandstone	εl	Leithsville Sandstone
Dm	Marcellus Shale		PRECAMBRIAN
	SILURIAN	gh	Mostly Hornblende Granite and Gneiss
Sgp	Green Pond Conglomerate		
Shf	High Falls Formation		
Sp	Poxono Island Formation		

GEOLOGIC MAP
PINECLIFF LAKE DAM

PLATE 2


PLAN
LONGITUDINAL SECTION
CROSS SECTION OF EARTH FILL DAM
CROSS SECTION REINFORCED
PLAN OF SPILLWAY ABUTMENT
ELEVATION OF SPILLWAY ABUTMENT



APPENDIX A

CHECK LIST - VISUAL OBSERVATIONS

CHECK LIST - ENGINEERING, CONSTRUCTION MAINTENANCE DATA

CHECK LIST
VISUAL INSPECTION
PHASE 1

Name Dam PINECLIFF LAKE DAM County Passaic State New Jersey Coordinators NJ-DEP

Date(s) Inspection November 15, 1979
December 5, 1979
Weather Cloudy Temperature 38°F

Pool Elevation at Time of Inspection 635 NGVD Tailwater at Time of Inspection 626 NGVD

Inspection Personnel:

November 15, 1979:

Chuck Chin
Henry King (Recorder)
Thomas Lakovich

December 5, 1979:

Chuck Chin
James McCormick

Owner/Representative: None attended.

CONCRETE SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
SEEPAGE OR LEAKAGE	Leakage was noticed at a downstream crack in the left abutment wall. The first two buttress slabs, next to the left abutment wall, showed leakage at their joints.	Grout crack and joints.
STRUCTURES TO ABUTMENT/EMBANKMENT JUNCTIONS	Severe spalling at left abutment face. Minor spalling at right abutment face.	Repair spalling.
DRAINS	Yes. Low level outlet drain - See "Outlet Works".	

CONCRETE SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A.	
STRUCTURAL CRACKING	Three cracks at the left abutment wall. One was continuous from abutment top to apron. One crack at right abutment wall.	Repair cracks.
VERTICAL AND HORIZONTAL ALINGMENT	Good.	
MONOLITH JOINTS	N/A.	
CONSTRUCTION JOINTS	Poor at the first two buttress slabs next to the left abutment wall. See "Seepage or Leakage".	Grout joints.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
SURFACE CRACKS	None noticed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	No visible movement or cracking at or beyond toe was noticed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	No sloughing or erosion was visible.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Good.	
RIPRAP FAILURES	None.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
EARTH EMBANKMENT	Numerous trees, small to large sized, and shrubs are growing on both sides of the embankment. Refuse (such as corrugated metal piping, concrete, concrete piping, etc.) has been dumped in some areas of the left embankment.	Remove trees, shrubs and refuse.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good.	
ANY NOTICEABLE SEEPAGE	Small flow was observed as a channel along most of the toe of the right embankment. The source of the flow could not be located. The source and the flow were inaccessible and obscured by dense vegetation. No seepage was observed along the left embankment but beyond its toe the ground was soggy and wet.	Cut and remove vegetation at toe and beyond for both embankments. Investigate flow, sogginess and wetness. Monitor, if seepage exists.
STAFF GAGE AND RECORDER	None.	
DRAINS	None.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACE IN STILLING BASIN	None.	
INTAKE STRUCTURE	Low level drain under water in lake. Not visible.	
OUTLET STRUCTURE	The low level outlet is a manually operated rising stem sluice gate. The outlet, 24-in. diameter sluice way, is at the right abutment under the spillway. It appears in good condition. The outlet valve stem and stand are mounted on a steel bracket attached to the right abutment. The valve stem and stand appear to be in fair condition. The hand wheel, required to operate the valve, is missing. Operation of valve could not be performed because the owner/representative was not present. However, the owner stated the valve can be operated satisfactorily but with difficulty.	Replace hand wheel and check valve to determine if operable.
OUTLET FACILITIES	None.	
EMERGENCY GATE	None.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONCRETE WEIR	See "Concrete Spillway". Flashboards, 14 inches high, spanned the spillway but did not create any damming. The boards are raised off the spillway by a series of blocks. Water flows through the opening between the spillway and boards.	
APPROACH CHANNEL	Reservoir.	
DISCHARGE CHANNEL	Good condition.	
BRIDGE AND PIERS	None.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONCRETE SILL N/A.		
APPROACH CHANNEL N/A.		
DISCHARGE CHANNEL N/A.		
BRIDGE AND PIERS N/A.		
GATES AND OPERATION EQUIPMENT N/A.		

VISUAL EXAMINATION OF	INSTRUMENTATION OBSERVATIONS	REMARKS AND RECOMMENDATIONS
MONUMENTATION/SURVEYS None.		
OBSERVATION WELLS None.		
WEIRS None.		
PIEZOMETERS None.		
OTHER None.		

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
SLOPES	Side slopes are moderate. No indication of slope instability.	
SEDIMENTATION	Reservoir water surface is clear with no vegetation.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Cluttered with assorted debris, vegetation and one large overturned tree in vicinity of spillway. Condition improves further downstream. The Union Valley Road bridge crosses the channel about 300 feet downstream.	Clean out.
SLOPES	Flat.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	A bar business fronts Union Valley Road to the channel's left and,to its right, there are numerous small businesses. All front the downstream portion of the road.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Available on microfilm at N.J. Department of Environmental Protection (NJ-DEP), 1474 Prospect Street, P.O. Box CN-029, Trenton, NJ 08626
REGIONAL VICINITY MAP	Available. Passaic County Map and USGS Quadrangle sheet for Greenwood Lake, New York - New Jersey.
CONSTRUCTION HISTORY	No formal history exists, but can be deduced from available microfilm at NJ-DEP.
TYPICAL SECTIONS OF DAM	Available on microfilm at NJ-DEP.
HYDROLOGIC/HYDRAULIC DATA	Limited data available at NJ-DEP.
OUTLETS - PLAN	Available on microfilm, NJ-DEP.
- DETAILS	Available on microfilm, NJ-DEP.
- CONSTRAINTS	None.
- DISCHARGE RATINGS	Not available.
RAINFALL / RESERVOIR RECORDS	Not available.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
(continued)

ITEM	REMARKS
DESIGN REPORTS	None available.
GEOLOGY REPORTS	Available USGS Geologic overlay sheet for Passaic County and Engineering Soils Survey of New Jersey, Report No. 3 - Passaic County, by Rutgers University (New Brunswick, NJ).
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available.
POST-CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	Unknown.
SPILLWAY PLAN - SECTIONS - DETAILS	Available on microfilm, NJ-DEP.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
(continued)

ITEM	REMARKS
OPERATING EQUIPMENT PLANS AND DETAILS	None available.
MONITORING SYSTEMS	None available.
MODIFICATIONS	Existing embankment raised one foot in 1930. Available on microfilm, NJ-DEP.
HIGH POOL RECORDS	Not kept.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Existing condition report, October 1969. Available on microfilm, NJ-DEP.
PRIOR ACCIDENTS OF FAILURE OF DAM - DESCRIPTION - REPORTS	None known to exist.
MAINTENANCE OPERATION RECORDS	None known to exist.

APPENDIX B

PHOTOGRAPHS

(Photos taken on December 5, 1979
and on January 21, 1980)

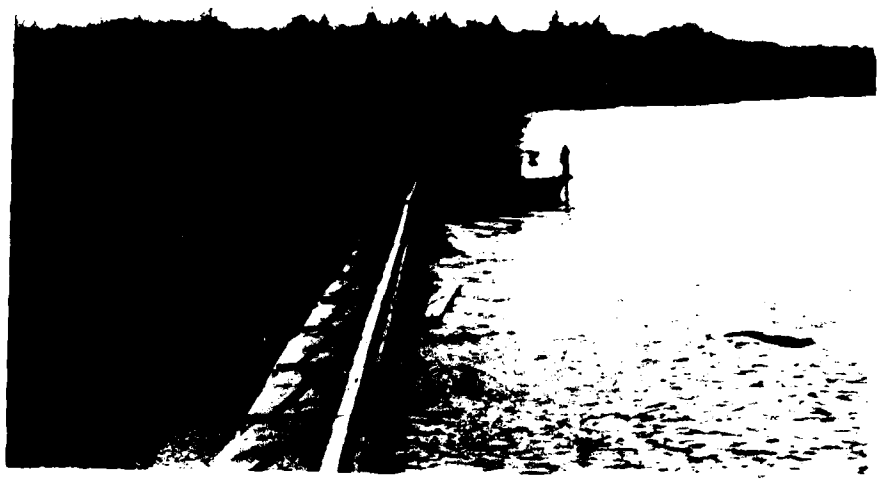


Photo 1 - View toward right abutment and embankment. Note outlet valve, rising stem and stand mounted on steel bracket, attached to abutment. Also note trees on embankment. (Photo taken December 5, 1979).

Photo 2 - View toward lake from right embankment. Note horizontal crack in right abutment and missing hand wheel for rising stem sluice gate described in Photo 1. (Photo taken December 5, 1979).

Photo 3 - Detail showing 24-inch sluice way outlet in right abtument under spillway. (Photo taken December 5, 1979).

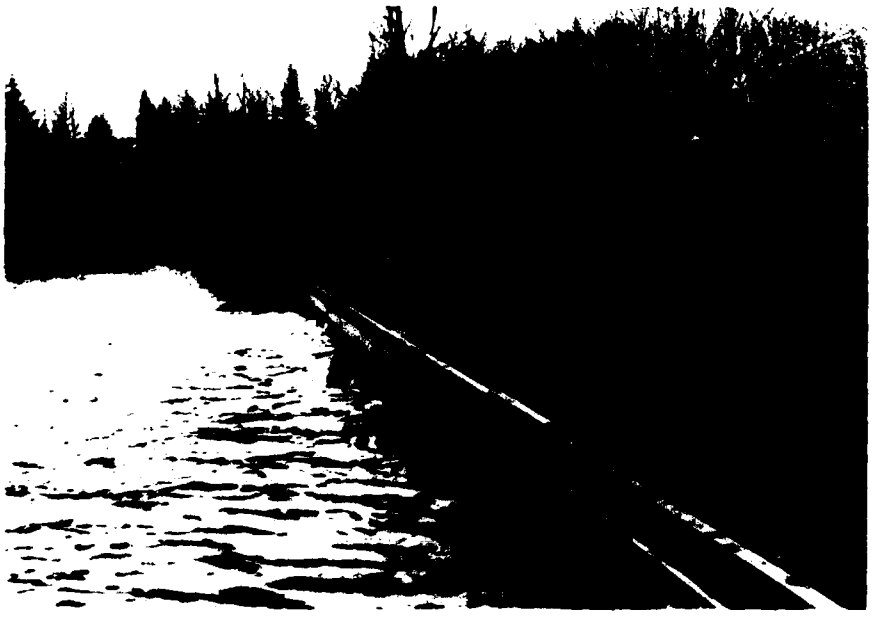


Photo 4 - View looking toward left abutment and embankment. (Photo taken December 5, 1979).

Photo 5 - View of downstream channel looking toward left abutment. Note uprooted tree laying in channel. (Photo taken December 5, 1979).

Photo 6 - View of left embankment. Note concrete and corrugated metal pipe dumped on embankment. (Photo taken December 5, 1979).

Photo 7 - Detail showing crack and spalling, near spillway of left abutment. (Photo taken December 5, 1979).

Photo 8 - View is from left embankment. Detail showing cracks in upstream portion of left abutment. Core wall is visible at left. (Photo taken January 21, 1980).

Photo 9 - View of downstream channel toward spillway.
(Photo taken December 5, 1979).

Photo 10 - View of downstream channel toward Union Valley Road, top center. Channel crosses under road approximately 300 feet from spillway.
(Photo taken January 21, 1980).

APPENDIX C

SUMMARY OF ENGINEERING DATA

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

Name of Dam: PINECLIFF LAKE DAM

Drainage Area Characteristics: 7.0 square miles

Elevation Top Normal Pool (Storage Capacity): 636.2 NGVD (723 acre-feet)

Elevation Top Flood Control Pool (Storage Capacity): N/A

Elevation Maximum Design Pool: 642.48 NGVD (SDF pool: 1,987 acre-feet)

Elevation Top Dam: 638 ft. NGVD(1,011 acre-feet)

SPILLWAY CREST:

a. Elevation 635 NGVD(concrete weir) 636.2 NGVD (flashboard)

b. Type Broadcrest

c. Width 4 ft.

d. Length 118 ft.

e. Location Spillover Entire length

f. No. and Type of Gates None

OUTLET WORKS:

a. Type 24-inch sluice way

b. Location Through left abutment wall

c. Entrance Inverts 626.1 NGVD

d. Exit Inverts 626 NGVD

e. Emergency Draindown Facilities Sluice gate 24-inch sluice way

HYDROMETEOROLOGICAL GAGES:

a. Type None

b. Location None

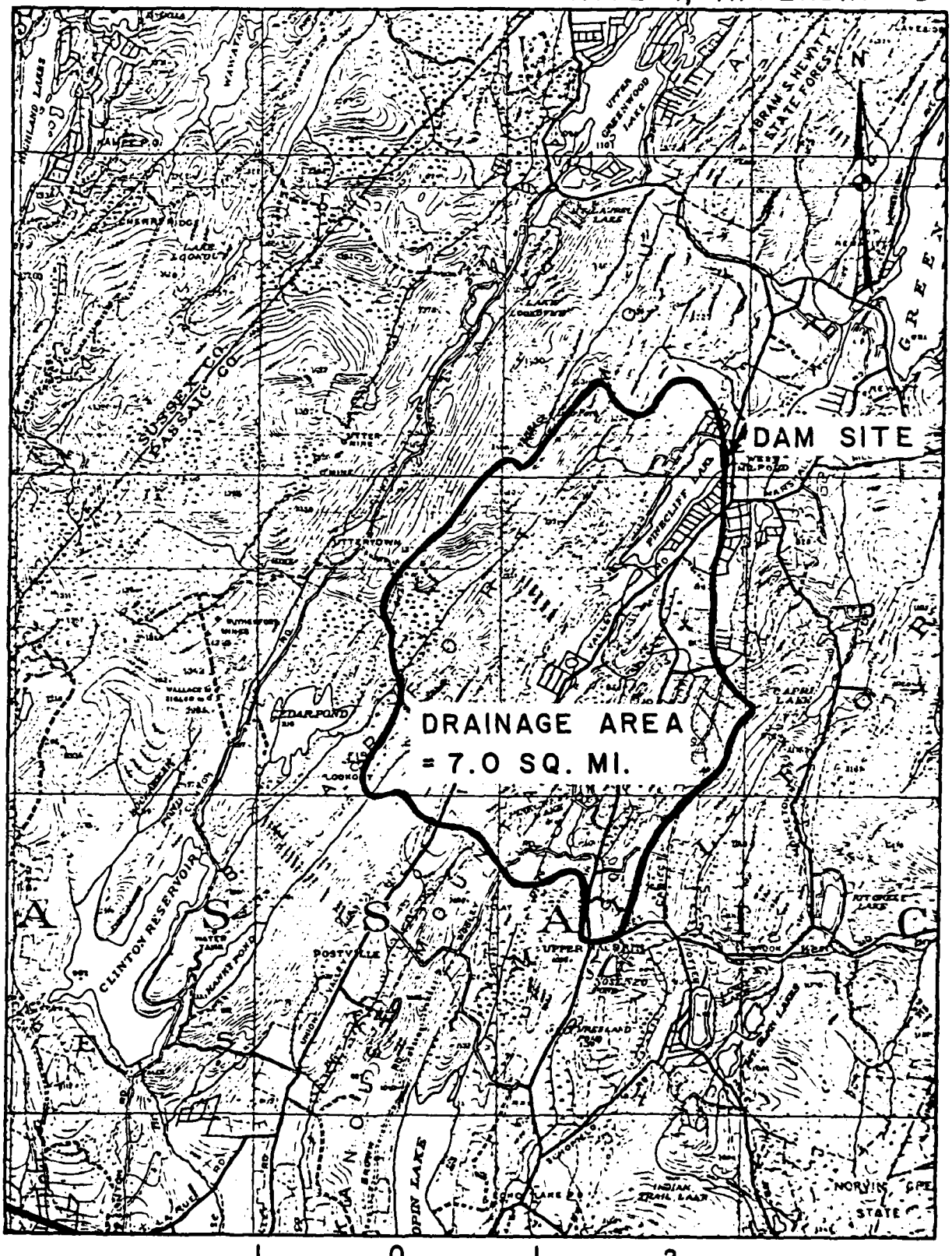
c. Records None

MAXIMUM NON-DAMAGING DISCHARGE: 940 cfs at elevation 638 NGVD

APPENDIX D

HYDROLOGIC COMPUTATIONS

PLATE I, APPENDIX D



0 1 2

Scale: 1" = 1 Mile

PINECLIFF LAKE DAM
DRAINAGE BASIN

Group XVII

PINECLIFF LAKE DAM (N.J. 00012)

SIZE CLASSIFICATION

Main Impoundment Surface Area	139 Acres
Average Depth of lake	10 ft ±
Structural Height of Dam	15 ft
Size Classification	Intermediate

HAZARD POTENTIAL CLASSIFICATION

Moderate to Heavily travelled road during rush hours & Commercial shops at D/S along Union Valley Rd.

Hazard Potential	High
Recommened SDF	PMF

HYDROLOGIC ANALYSIS

Flood routing will be computed by HEC-1 DB Computer program using SCS Triangular Unit Hydrograph with curvilinear transformation.

D.A. = 7.00 SQ. MI.

PRC Harris, Inc.
CONSULTING ENGINEERS

SUBJECT N.J. DAM SAFETY INSPECTION
PINCLIFF LAKE DAM
COMPUTED BY C.L.C. CHECKED BY RK

SHEET NO. 2 OF 10
JOB NO. 10-A32-01
DATE 1-16-80

PRECIPITATION

From fig. 15 (Ref.: 'Design of small Dam,' p 48), the drainage basin located at the boundary between Zone 1 & Zone 6 where the Probable Max. Precipitation = 25 inches based on 6 HRS. duration and a 10 SQ MI. basin area.

DURATION (HRS.)	% of PMF			
	ZONE 1	ZONE 6	AVG.	
6	99	100	100	Note: Values are reduced by 20% to account for mis-alignment of basin & storm isohytal.
12	111	109	110	
24	119	117	118	
48	127	126	127	

INFILTRATION DATA

Drainage area consists of most Ssl, $\frac{GMX24R}{Ssh}$ and $\frac{GMX24R}{MMo}$.

Hydrologic Soil Group	C/D
Initial Infiltration	0.8 inch
Constant Infiltration	0.03 in/hr.

Ref 'Engineering Soil Survey of N.J. Report 3, Passaic County' by Rutgers University.

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SUBJECT N.J. DAM SAFETY INSPECTION
PINECLIFF LAKE DAM
COMPUTED BY C.L.C. CHECKED BY JK

SHEET NO. 3 OF 10
JOB NO. 11-A33-01
DATE 1-16-80

TIME OF CONCENTRATION

1) From Velocity & Water Course Lengths

	Slope (%)	Vel. (fps)	Remark
Overland Flow	$\frac{1300-1020}{1700} = 16.5$	3.5	Woodland
Channel Flow	$\frac{1020-638}{15500} = 2.5$	2.0	

$$t_c = (1700/3.5 + 15500/2.0)/3600 = 2.3 \text{ hrs}$$

2) From Nomograph Diagram, "Design of Small Dam", p. 71

$\Delta H = 1300 - 638 = 662$ $\quad L = 17200$ $\quad S = \frac{662}{17200} = 3.8\%$

$t_c = 0.7$ hr

3) Using FAA Formula for Surface Flow (Airport Drainage)

$$T_c = \frac{1.8(1.1-C)\sqrt{D}}{\sqrt[3]{S}} = \frac{1.8(1.1-0.3)\sqrt{17200}}{\sqrt[3]{3.8}\ (60)} = 2.02 \text{ HRS.}$$

Use $T_c = 1.67$ hr

$LAG = 0.6\,T_c = 0.6(1.67) = 1.00$ HRS.

PRC Harris, Inc.
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SUBJECT N.J. DAM SAFETY INSPECTION
PINECLIFF LAKE DAM
COMPUTED BY C.L.C. CHECKED BY PJK

SHEET NO. 4 OF 10
JOB NO. 10-A82-21
DATE 1-17-89

ELEVATION - AREA - CAPACITY RELATIONSHIP

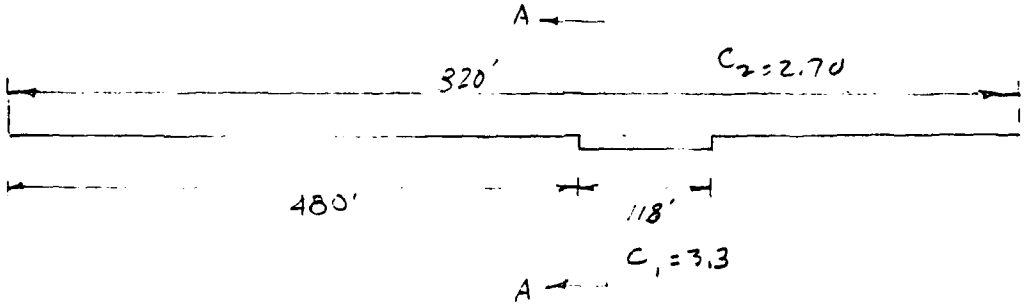
Data Estimated From U.S.G.S. Map

Elevation (Ft)	621*	636	640	660	680
Surface Area (Ac.)	0	139	222.2	427	577.6

* Estimated Lake bottom elevation $H_T = h / \left[\sqrt{\frac{A_2}{A_1}} - 1\right] = \frac{4}{\sqrt{\frac{222}{139}} - 1} = 15'$

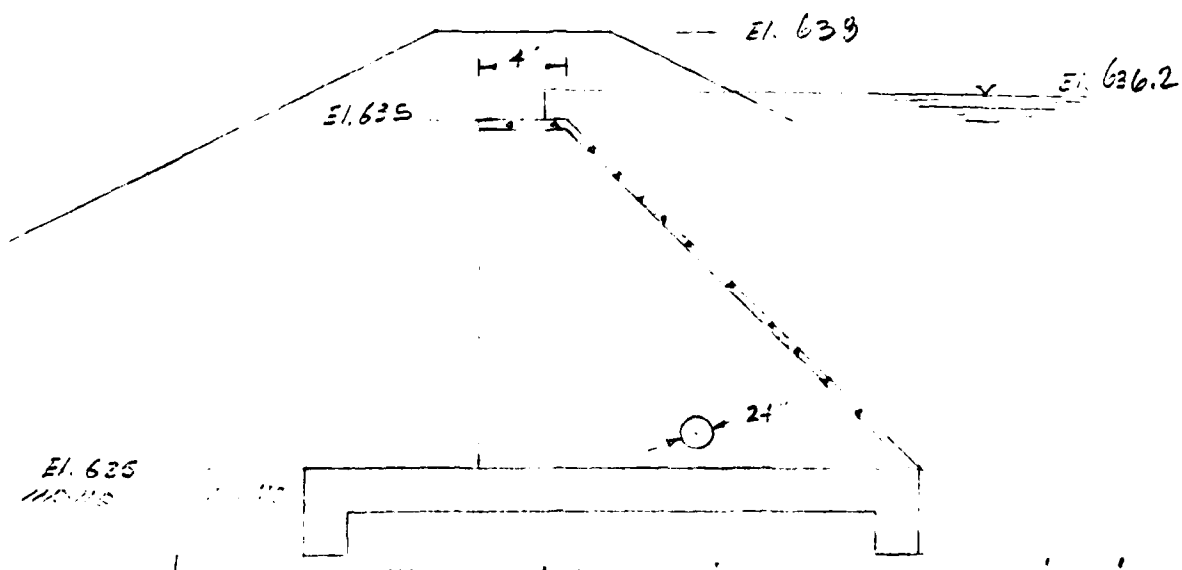
636 - 15 = 621

HEC-1 DB program will develope storage - capacity relationship from the surface areas & elevations.



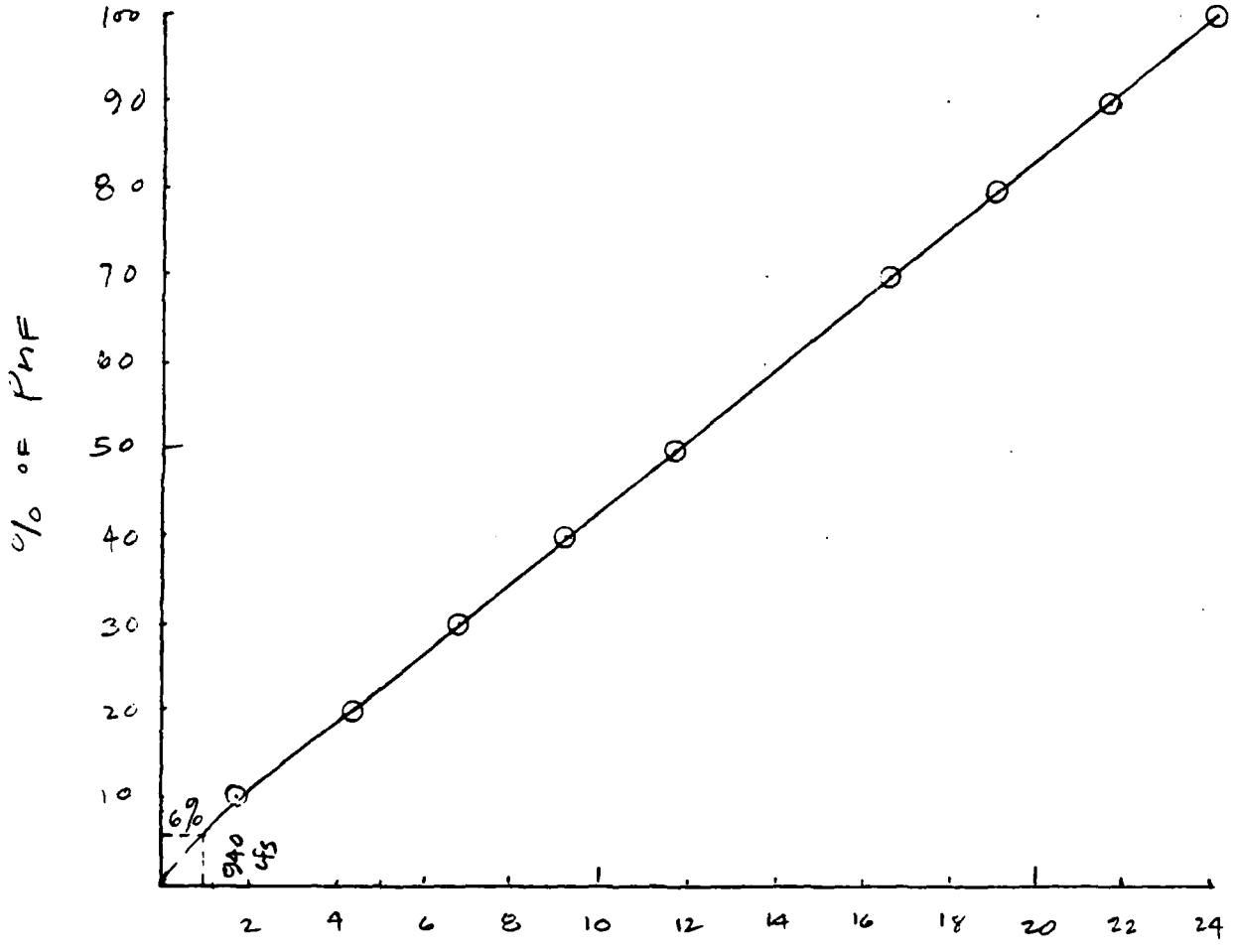
A

Assume $C_1 = 3.3$ Standard crest weir Table 5-3 Broad Crested Weirs. King & Brater
$C_2 = 2.7$ HEC-2 user manual



The opening between the spillway and boards is small (approx. 0.1' x 12') and is usually plugged by debris, hence the area is not considered to be effective.

Overtopping Potential



Overtopping of Dam occurs at Ele ~35.0
w.h. Q = 940 cfs (~ 6% PMF)

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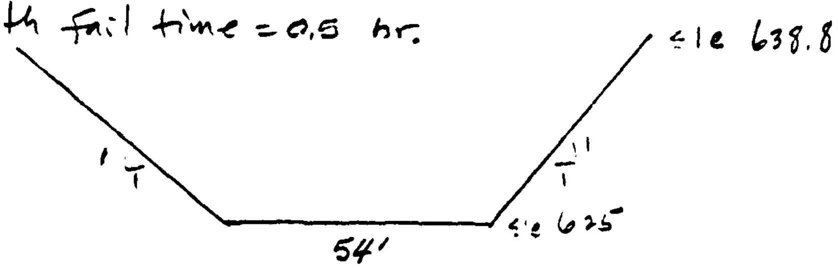
SUBJECT: NJ Dam [illegible] PRG, Group XVI [illegible]
COMPUTED BY: EK CHECKED BY: CLC
SHEET NO. 6 OF 40
JOB NO. [illegible]
DATE: 1/25/80

Sensitivity Analysis Summary

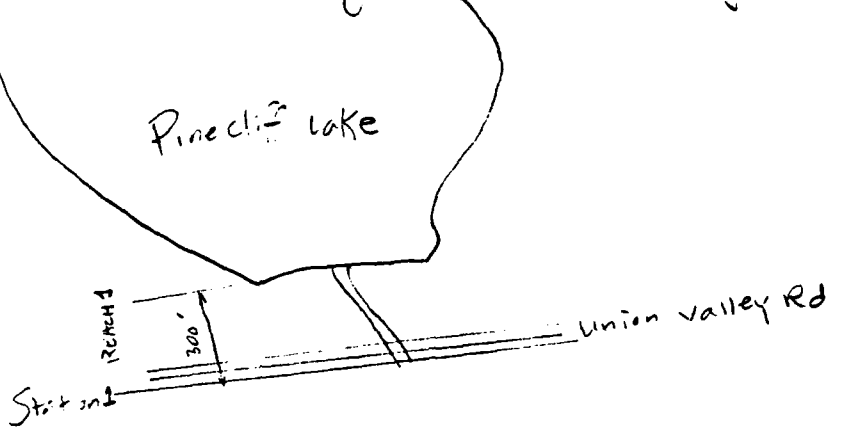
Breach Width Ft	Side Slope Ft	Breach bottom elev.	Fail time	Initial Water Surface elev	Ratio of PMF	Fail Elev.	D/s channel: Max. Stage with failure Ft	D/s channel: Stage w/ no failure overtop Ft	D.S. Stage (Ft
54	1	625	0.5	636.2	0.1	638.8	629.4	623.9	5.5
54	1	625	0.5	636.2	0.2	639.17	626.5	626.5	0
54	1	625	0.5	636.2	0.4	640.19	631.6	629.3	2.3
54	1	625	0.5	636.2	0.7	641.42	633.0	631.7	1.3
54	1	625	0.5	636.2	1.0	642.48	633.3	633.3	0

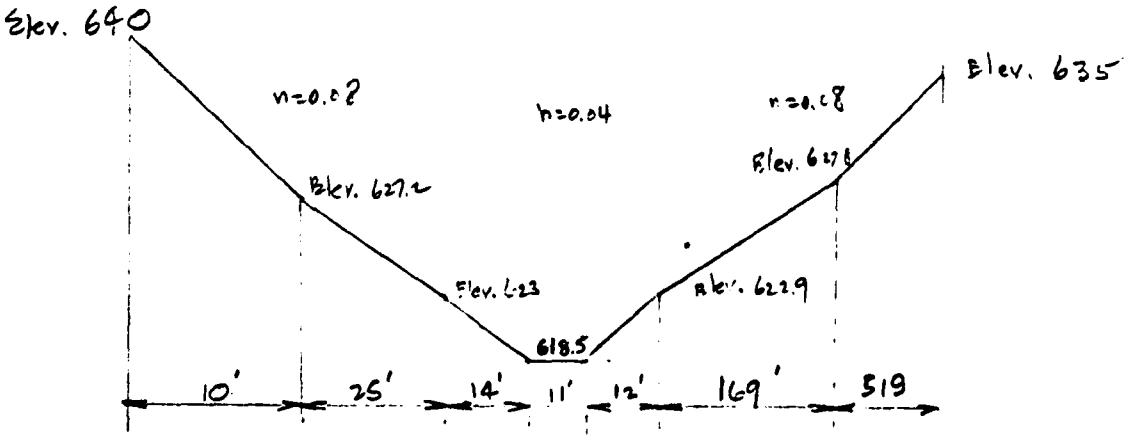
Breach analysis

Based on sensitivity analysis (see above), the breach begins to develop when lake stage reaches Elev. 629.4 @ 10% PMF with fail time = 0.5 hr.



Assume bridge across the stream fails instantly upon impact of flood wave. The resulting energy loss is negligible.





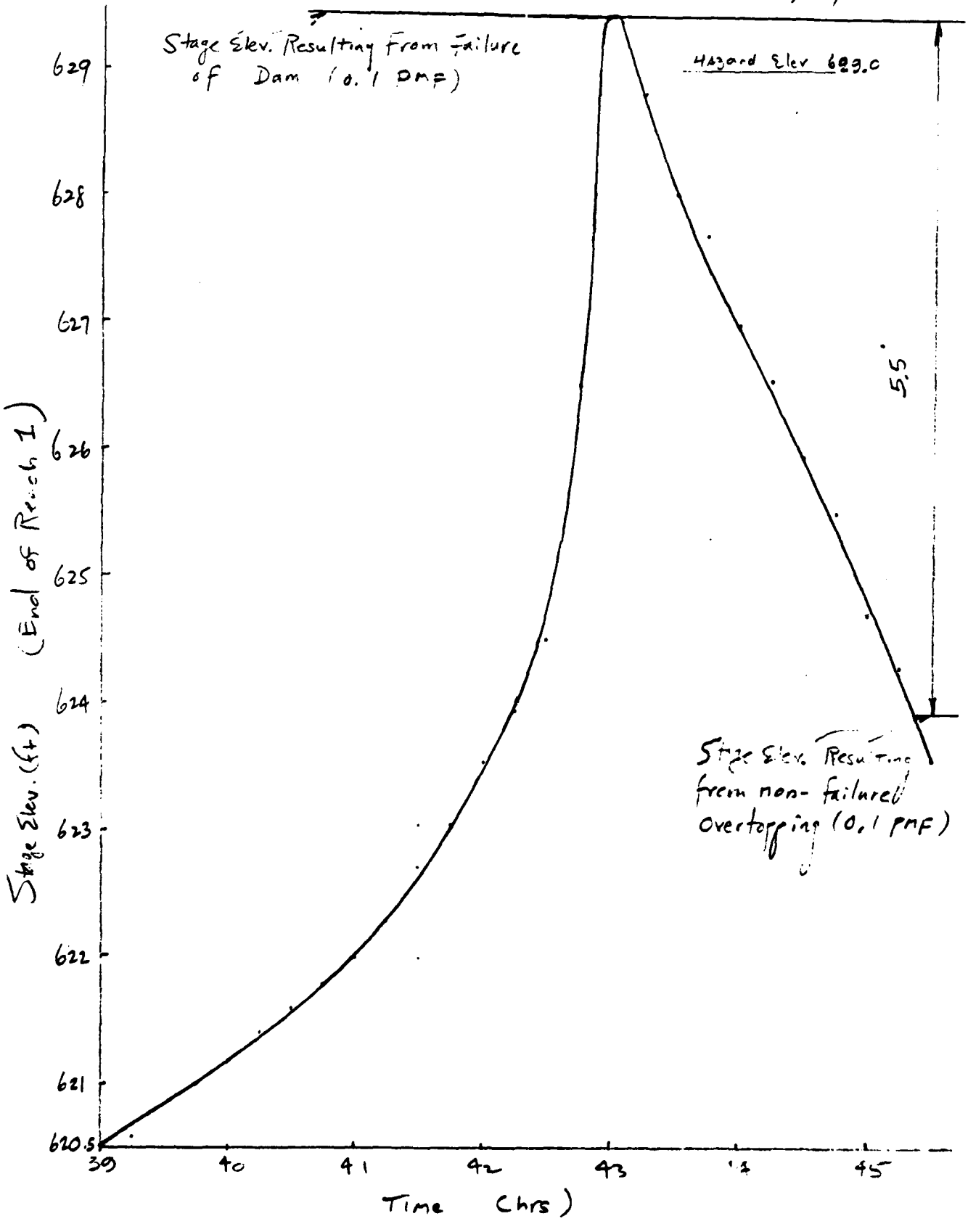
X - Section

L = 300'

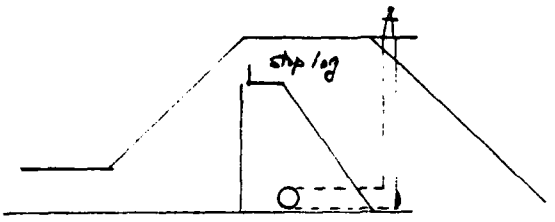
S = 0.017

PRC Harris, Inc.
CONSULTING ENGINEERS

SUBJECT NJ Dam Safety Prog Group XVII — Pierdiff Lake
COMPUTED BY RK CHECKED BY CLC
SHEET NO. 8 OF 10
JOB NO. 10-AP2-01
DATE 3/18/80



DRAWDOWN COMPUTATION



Low level outlet 24"ϕ
assume to be C.I.P

Assume $K_e = 0.5$, $K_{value} = 0.19$ (full open)

$\epsilon = 0.00085$ ⇒ complete turbulent

$\frac{\epsilon}{D} = 0.00043 \Rightarrow f = 0.0154$ (complete Turbulence)

$$H = \left(K_e + K_{value} + \frac{fl}{D} + 1 \right) \frac{V^2}{2g}$$

$$= \left(0.5 + 0.19 + \frac{(0.0154)(12)}{2} + 1 \right) \frac{V^2}{2g} = 0.028 V^2$$

$$V = 6.01\sqrt{H}$$

$$Q = VA = 6.01\sqrt{H}\left(\frac{\pi}{4} 2^2\right) = 18.9\sqrt{H}$$ From El. 635 to 626

$$Q = CLH^{1.5} = 2.7(118) H^{1.5} = 318.6 H^{1.5}$$ From El. 636 to 635

1. Removal of stop log
2. Drain from the 24"ϕ pipe

D.A. = 7 mi²

Inflow = (2 cfs/sq. mi.)(7.0 sq. mi.) = 14.0 cfs

Assume Tail water @ El. 626

PRC Harris, Inc.
CONSULTING ENGINEERS

SUBJECT N.J. DAM SAFETY INSPECTION
PINECLIFF LAKE DAM
COMPUTED BY C.L.C. CHECKED BY BK

SHEET NO. 10 OF 10
JOB NO. 10-AB3-01
DATE 3/5/80

DRAWNDOWN COMPUTATION (CONTINUED)

Res. Ele.	Area Ac.	AVG. Area	Vol. Ac-ft	AVG. Res. El.	Q outlet	Draw Down time 24 Vol / 1.98Q	Cul. Time
636.2	143						
		132	158.4		41.9	4.6	4.6
635	121						
		112.5	112.5	634.5	55.1	24.8	29.4
634	104						
		96.5	96.5	633.5	51.8	22.6	52.0
633	89						
		81.9	81.9	632.5	48.2	20.6	72.6
632	74.8						
		68.3	68.3	631.5	44.3	18.7	91.3
631	61.8						
		55.9	55.9	630.5	40.1	16.9	108.2
630	50						
		44.8	44.8	629.5	35.4	15.3	123.5
629	39.5						
		34.9	34.9	628.5	30.0	14.1	137.6
628	30.3						
		26.3	26.3	627.5	23.2	13.7	151.3
627	22.2						
		18.8	18.8	626.5	13.4	17.0	168.3
626	15.4						

Time of complete drawdown without inflow = 168.3 HRS. = 7 days

$A_2 = \left(\frac{L_2}{L_1}\right)^2 A_1$ $\quad A_1 = 139\ Ac$ $\quad L_1 = 636.2 - 621 = 15.2'$

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A1              N J DAM SAFETY INSPECTION PROGRAM----GROUP XVII  10A8301
A2              N J 00012 PINECLIFF LAKE,PASSAIC COUNTY, NJ
A3              MULT RATIO ROUTING CASE 1,PRC-HARRIS INC., WOODBRIDGE, N J
B     150       0      15                                    0       0       4
B1      5
J       1       9       1
J1    1.0       9      .8      .7      .5      .4      .3       2      .1
K       0    LAKE                       0       0       1
K1              INFLOW HYDROGRAPH THROUHG PINECLIFF LAKE
M       1       2    7.00            7.00     0.8                            1
P              25     100     110     118     127
T                                                     0.8    0.08
W2           1.00
X      -1    -.05       2
K       1     DAM                       0       0       1
K1              ROUTING DISCHARGE THROUGH DAM
Y                               1       1
Y1      1                                          -636.2                     0
$A      0     139     222     427     578
$E    621     636     640     660     680
$$  636.2     118     3.3     1.5
$D    638    2.70     1.5     702
K      99
A
A
A
A
A
#
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N J DAM SAFETY INSPECTION PROGRAM---GROUP XVII 10A8301
N J 00012 PINECLIFF LAKE,PASSAIC COUNTY, NJ
MULTI RATIO ROUTING CASE 1,PRC-HARRIS INC., WOODBRIDGE, N J

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	15	0	0	0	0	0	4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1

RTIOS=	1.00	.90	.80	.70	.50	.40	.30	.20	.10

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SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH THROUHG PINECLIFF LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LAKE	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	7.00	0.00	7.00	.80	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	25.00	100.00	110.00	118.00	127.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	.80	.08	0.00	0.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= 1.00

RECESSION DATA
STRTQ= -1.00 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 22 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= 1.00 VOL= 1.00

360 1144. 2301. 2952. 2952. 2501. 1841. 1217. 840. 601.
415 291. 202. 140. 98. 68. 47. 33. 25. 17.
10 3.

Prof

0 MO DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLOW COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1 01	.15	1	00	0.00	00	7.	1.02	.15	97	.03	.01	.02	23.
1 01	.30	2	00	0.00	.00	6.	1.02	.30	98	.03	.01	.02	22.
1 01	.45	3	.00	0.00	00	6.	1.02	.45	99	.03	.01	.02	25.
1.01	1.00	4	.00	0.00	00	5.	1.02	1.00	100	.03	01	02	45.
1 01	1.15	5	00	0.00	00	5.	1.02	1.15	101	.03	.01	.02	65.
1 01	1.30	6	00	0.00	00	5.	1.02	1.30	102	.03	.01	.02	81.
1 01	1.45	7	.00	0.00	00	4.	1.02	1.45	103	.03	.01	.02	94.
1 01	2.00	8	00	0.00	00	4.	1.02	2.00	104	.03	.01	.02	102
1 01	2.15	9	00	0.00	00	4.	1.02	2.15	105	.03	.01	.02	107.
1 01	2.30	10	00	0.00	00	3.	1.02	2.30	106	.03	.01	.02	111.
1 01	2.45	11	00	0.00	00	3.	1.02	2.45	107	.03	.01	.02	114.
1 01	3.00	12	00	0.00	00	3	1.02	3.00	108	.03	.01	.02	116
1 01	3.15	13	00	0.00	00	3.	1.02	3.15	109	.03	.01	.02	117.
1.01	3.30	14	00	0.00	00	3.	1.02	3.30	110	.03	.01	.02	118.
1 01	3.45	15	00	0.00	00	2.	1.02	3.45	111	.03	.01	.02	119.
1 01	4.00	16	00	0.00	00	2.	1.02	4.00	112	.03	.01	.02	120.
1.01	4.15	17	.00	0.00	.00	2.	1.02	4.15	113	.03	.01	.02	120.
1.01	4.30	18	.00	0.00	00	2.	1.02	4.30	114	.03	.01	.02	120.
1.01	4.45	19	.00	0.00	.00	2.	1.02	4.45	115	.03	.01	.02	120.
1 01	5.00	20	.00	0.00	00	2.	1.02	5.00	116	.03	.01	.02	120.
1 01	5.15	21	.00	0.00	00	2.	1.02	5.15	117	.03	.01	.02	120.
1 01	5.30	22	00	0.00	00	2.	1.02	5.30	118	.03	.01	.02	120.
1 01	5.45	23	.00	0.00	00	1.	1.02	5.45	119	.03	01	.02	120.
1.01	6.00	24	.00	0.00	00	1.	1.02	6.00	120	.03	.01	.02	120.
1 01	6.15	25	.01	0.00	.01	1.	1.02	6.15	121	.08	.06	.02	141.
1 01	6.30	26	.01	0.00	.01	1.	1.02	6.30	122	.08	.06	.02	206.
1 01	6.45	27	.01	0.00	.01	1.	1.02	6.45	123	.08	.06	.02	336.
1 01	7.00	28	.01	0.00	.01	1.	1.02	7.00	124	.08	.06	.02	503.
1 01	7.15	29	.01	0.00	.01	1.	1.02	7.15	125	.08	.06	.02	671.
1 01	7.30	30	.01	0.00	.01	1.	1.02	7.30	126	.08	.06	.02	812.
1 01	7.45	31	.01	0.00	.01	1.	1.02	7.45	127	.08	.06	.02	917.
1 01	8.00	32	.01	0.00	.01	1.	1.02	8.00	128	.08	.06	.02	986.
1 01	8.15	33	.01	0.00	.01	1.	1.02	8.15	129	.08	.06	.02	1033.
1 01	8.30	34	.01	0.00	.01	1.	1.02	8.30	130	.08	.06	.02	1067.
1.01	8.45	35	.01	0.00	.01	1.	1.02	8.45	131	.08	.06	.02	1091.
1 01	9.00	36	01	0.00	.01	1.	1.02	9.00	132	.08	.06	.02	1107
1 01	9.15	37	.01	0.00	.01	1.	1.02	9.15	133	.08	.06	.02	1119.
1.01	9.30	38	.01	0.00	01	1	1.02	9.30	134	.08	.06	.02	1127.
1 01	9.45	39	.01	0.00	.01	0.	1.02	9.45	135	.08	.06	.02	1132.
1 01	10.00	40	01	0.00	.01	0.	1.02	10.00	136	.08	.06	.02	1136.
1 01	10.15	41	.01	0.00	.01	0.	1.02	10.15	137	.08	06	.02	1139.
1 01	10.30	42	.01	0.00	01	0.	1.02	10.30	138	.08	.06	.02	1141.
1 01	10.45	43	01	0.00	01	0.	1.02	10.45	139	.08	.06	.02	1142.
1 01	11.00	44	01	0.00	.01	0.	1.02	11.00	140	.08	.06	.02	1143.
1 01	11.15	45	01	0.00	01	0.	1.02	11.15	141	.08	.06	.02	1144.
1 01	11.30	46	01	0.00	.01	0.	1.02	11.30	142	.08	.06	.02	1144.
1 01	11.45	47	01	0.00	01	0.	1.02	11.45	143	.08	.06	.02	1144.
1 01	12.00	48	.01	0.00	01	0.	1.02	12.00	144	.08	.06	.02	1144.

3

1 01	12 15	49	04	0 00	04	0	1 02	12.15	145	.50	.48	.02	1294.
1 01	12 30	50	04	0 00	04	0	1 02	12.30	146	.50	.48	.02	1771.
1 01	12 45	51	04	0 00	04	0	1 02	12.45	147	.50	.48	.02	2729.
1 01	13 00	52	04	0 00	04	0	1 02	13.00	148	.50	.48	.02	3959.
1 01	13 15	53	05	0 00	05	0	1 02	13 15	149	.60	.58	.02	5225.
1 01	13 30	54	05	0 00	05	0	1 02	13 30	150	.60	.58	.02	6382.
1 01	13 45	55	05	0 00	05	0	0 00	0 00	151	.60	.58	.02	7379.
1 01	14 00	56	05	0 00	05	0	0 00	0 00	152	.60	.58	.02	8181.
1 01	14 15	57	06	0 00	06	0	0 00	0 00	153	.75	.73	.02	8881.
1 01	14 30	58	06	0 00	06	0	0 00	0 00	154	.75	.73	.02	9553.
1 01	14 45	59	06	0 00	06	0	0 00	0 00	155	.75	.73	.02	10255.
1 01	15 00	60	06	0 00	06	0	0 00	0 00	156	.75	.73	.02	10941.
1 01	15 15	61	06	.02	04	6.	0 00	0 00	157	.76	.74	.02	11556.
1 01	15 30	62	12	.10	02	52.	0 00	0 00	158	1 52	1 50	.02	12334.
1 01	15 45	63	32	.30	02	255.	0 00	0 00	159	4 26	4 24	.02	14571.
1 01	16 00	64	08	06	02	637	0 00	0 00	160	1 06	1 04	02	18570.
1 01	16 15	65	05	03	02	1112	0 00	0 00	161	.70	68	02	23522.
1 01	16 30	66	05	03	02	1417	0 00	0 00	162	.70	68	02	26222.
1 01	16 45	67	05	.03	02	1475.	0 00	0 00	163	.70	68	02	26040.
1 01	17 00	68	05	03	02	1364.	0 00	0 00	164	.70	68	02	23857.
1 01	17 15	69	04	02	02	1164	0 00	0 00	165	.55	.53	.02	20754.
1 01	17 30	70	04	02	02	964	0 00	0 00	166	.55	53	.02	17796.
1 01	17 45	71	04	02	02	820.	0 00	0 00	167	.55	53	.02	15673.
1 01	18 00	72	04	02	02	711	0 00	0 00	168	.55	53	.02	14079.
1 01	18 15	73	00	0 00	00	613.	0 00	0 00	169	.04	02	02	12593.
1 01	18 30	74	00	0 00	00	521	0 00	0 00	170	.04	.02	02	11049
1 01	18 45	75	00	0 00	00	422.	0 00	0 00	171	.04	.02	.02	9182.
1 01	19 00	76	00	0 00	00	324.	0 00	0 00	172	.04	.02	.02	7205.
1 01	19 15	77	00	0 00	00	237.	0 00	0 00	173	04	.02	.02	5375.
1 01	19 30	78	00	0 00	00	166.	0 00	0 00	174	.04	.02	02	3869.
1 01	19 45	79	00	0 00	00	114.	0 00	0 00	175	.04	.02	.02	2768
1 01	20 00	80	00	0 00	00	80.	0 00	0 00	176	.04	.02	.02	2038.
1 01	20 15	81	00	0 00	00	70.	0 00	0 00	177	.04	.02	.02	1538.
1 01	20 30	82	00	0 00	00	65	0 00	0 00	178	04	02	02	1270
1 01	20 45	83	00	0 00	00	61	0 00	0 00	179	.04	.02	02	1192
1 01	21 00	84	00	0 00	00	57.	0 00	0 00	180	.04	.02	.02	1112
1 01	21 15	85	00	0 00	00	53.	0 00	0 00	181	.04	.02	.02	1038.
1 01	21 30	86	00	0 00	00	50.	0 00	0 00	182	.04	.02	.02	968.
1 01	21 45	87	00	0 00	00	46.	0 00	0 00	183	.04	.02	.02	904.
1 01	22 00	88	00	0 00	00	43.	0 00	0 00	184	.04	.02	02	843
1 01	22 15	89	00	0 00	00	40.	0 00	0 00	185	.04	.02	.02	787
1 01	22 30	90	00	0 00	00	38	0 00	0 00	186	04	.02	.02	734
1 01	22 45	91	00	0 00	00	35.	0 00	0 00	187	.04	.02	.02	685
1 01	23 00	92	00	0 00	00	33.	0 00	0 00	188	.04	.02	.02	639.
1 01	23 15	93	00	0 00	00	31.	0 00	0 00	189	.04	.02	.02	596.
1 01	23 30	94	00	0 00	00	28.	0 00	0 00	190	.04	.02	.02	556.
1 01	23 45	95	00	0 00	00	27.	0 00	0 00	191	.04	.02	.02	519
1 02	0.00	96	00	0.00	00	25.	0.00	0.00	192	.04	.02	.02	484
									SUM	25.40	22.38	3.02	407584.
										(645.)(568.)(77.)(11541.49)			

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	26222.	13828.	4105.	2122.	407345.
CMS	743	392	116.	60.	11535.
INCHES		18.38	21.82	22.56	22.56
MM		466.76	554.29	572.90	572.90
AC-FT		6857.	8143.	8416.	8416.
THOUS CU M		8458.	10044.	10381.	10381.

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HYDROGRAPH ROUTING

ROUTING DISCHARGE THROUGH DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DAM	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-636.	0

SURFACE AREA=	0.	139.	222.	427.	578.
CAPACITY=	0.	695.	1411	7790.	17802.
ELEVATION=	621	636.	640	660.	680.

CREL	SPWID	CONW	EXPW	ELEVL	COQL	CAREA	EXPL
636.2	118.0	3.3	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
638.0	2.7	1.5	702.

PEAK OUTFLOW IS 24070. AT TIME 41.00 HOURS

PEAK OUTFLOW IS 21590. AT TIME 41.00 HOURS

PEAK OUTFLOW IS 19112. AT TIME 41.00 HOURS

PEAK OUTFLOW IS 16638. AT TIME 41.00 HOURS

PEAK OUTFLOW IS 11707. AT TIME 41.00 HOURS

PEAK OUTFLOW IS 9259. AT TIME 41.00 HOURS

PEAK OUTFLOW IS 6828. AT TIME 41.00 HOURS

PEAK OUTFLOW IS 4383. AT TIME 41.25 HOURS

PEAK OUTFLOW IS 1710. AT TIME 41.50 HOURS

1 ********** ********** ********** ********** **********

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS								
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
				1.00	.90	.80	.70	.50	.40	.30	.20	.10
HYDROGRAPH AT	LAKE	7.00	1	26222.	23600.	20978.	18355.	13111.	10489	7867.	5244.	2622.
	(	18.13)	(	742.52)(	668.27)(	594.02)(	519.77)(	371.26)(	297.01)(	222.76)(	148.50)(	74.25)
ROUTED TO	DAM	7.00	1	24070.	21590.	19112.	16638.	11707.	9259.	6828.	4383.	1710.
	(	18.13)	(	681.59)(	611.36)(	541.20)(	471.13)(	331.52)(	262.20)(	193.35)(	124.12)(	48.43)

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	636.20	636.20	638.00
STORAGE	723.	723.	1011
OUTFLOW	0.	0.	940.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	642.48	4.48	1987.	24070.	11.00	41.00	0.00
.90	642.14	4.14	1905.	21590.	10.25	41.00	0.00
.80	641.79	3.79	1821.	19112.	9.75	41.00	0.00
.70	641.42	3.42	1735.	16638.	9.25	41.00	0.00
.50	640.63	2.63	1552.	11707.	8.00	41.00	0.00
.40	640.19	2.19	1453.	9259.	7.50	41.00	0.00
.30	639.72	1.72	1348.	6828.	6.75	41.00	0.00
.20	639.17	1.17	1234.	4383.	5.50	41.25	0.00
.10	638.38	.38	1081.	1710.	3.00	41.50	0.00

1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****
15 44 53 JOB(CM277000,T200,I0400,L20,P20)

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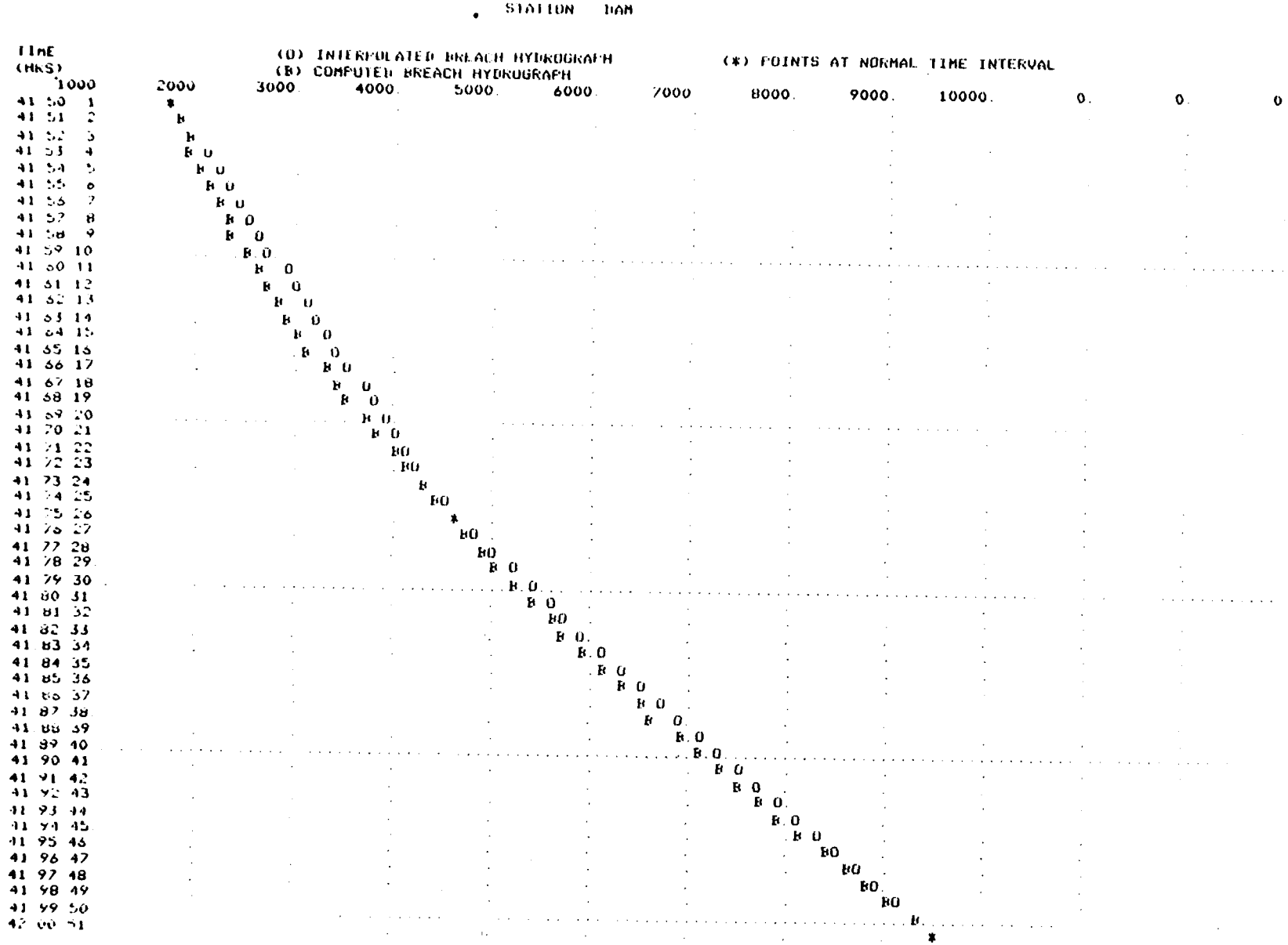
[illegible]   N J DAM SAFETY INSPECTION PROGRAM  -GROUP XVII  10A8301
[illegible]   N J 00012 PINECLIFF LAKE,PASSAIC COUNTY, NJ
[illegible]   SENSITIVITY ANALYSIS CASE 1,PRC HARRIS INC., WOODBRIDGE, N J
[illegible]       15                                   0        0        1

                 1        1
[illegible]   1
[illegible]   0    LAKE                   0        0        1
K1                 INFLOW HYDROGRAPH THROUHG PINECLIFF LAKE
[illegible]   1      2     7.00          7.00      0 8                          1
                  25     100      110      118      127
[illegible]                                                  0.8      0.08
[illegible]          1.00
[illegible]  -1      -.05      2
K       1    DAM                     0        0        1
K1                 ROUTING DISCHARGE THROUGH [illegible]
Y                                   1        1
Y1      1                                              -636.2                  0
$A      0     139      222      427      578
$E    621     636      640      660      680
$$  636.2     118      3.3      1.5
$[illegible]    638    2.70      1.5      702
$[illegible]     54       1      625      0.5    636.2   700.00
$[illegible]     54       1      625      0.5    636.2   638.38
K       1  REACH1                                       1
K1        CHANNEL ROUTING
Y                                   1        1
Y1      1
Y[illegible]     08      04       08    618.5      635      300    0.017
Y[illegible]    690     640      700    627.2      725      623      739    618.5      750    618.5
Y[illegible]    762   622.9      831    627.8     1350      635
K      99
A
[illegible]
```

17

STATION DAM


TIME (HRS)
(O) INTERPOLATED BREACH HYDROGRAPH
(B) COMPUTED BREACH HYDROGRAPH
(*) POINTS AT NORMAL TIME INTERVAL
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
0.
0.
0
41 50 1
41 51 2
41 52 3
41 53 4
41 54 5
41 55 6
41 56 7
41 57 8
41 58 9
41 59 10
41 60 11
41 61 12
41 62 13
41 63 14
41 64 15
41 65 16
41 66 17
41 67 18
41 68 19
41 69 20
41 70 21
41 71 22
41 72 23
41 73 24
41 74 25
41 75 26
41 76 27
41 77 28
41 78 29
41 79 30
41 80 31
41 81 32
41 82 33
41 83 34
41 84 35
41 85 36
41 86 37
41 87 38
41 88 39
41 89 40
41 90 41
41 91 42
41 92 43
41 93 44
41 94 45
41 95 46
41 96 47
41 97 48
41 98 49
41 99 50
42 00 51

HYDROGRAPH ROUTING

CHANNEL ROUTING

	ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
KEACH1		1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	ISTR
0.0	0.000	0.00	1	1	0	0	0

	NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
	1	0	0	0.000	0.000	0.000	0.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
0800	0400	.0800	618.5	635.0	300.	.01700

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

690.00 640.00 700.00 627.20 725.00 623.00 739.00 618.50 750.00 618.50
762.00 622.90 831.00 627.80 1350.00 635.00

STORAGE	0.00	.08	.19	.33	.51	.71	.97	1.34	1.81	2.38
	3.06	3.85	4.93	6.40	8.24	10.46	13.06	16.04	19.39	23.15
OUTFLOW	0.00	45.79	160.23	347.04	614.87	972.75	1519.57	2216.29	3072.92	4107.80
	5337.59	6711.01	8281.83	10305.95	12816.19	15870.80	19530.29	23853.65	28897.68	34717.10
STAGE	618.50	619.37	620.24	621.11	621.97	622.84	623.71	624.58	625.45	626.32
	627.18	628.05	628.92	629.79	630.66	631.53	632.39	633.26	634.13	635.00
FLOW	0.00	45.79	160.23	347.04	614.87	972.75	1519.57	2216.29	3072.92	4107.80
	5337.59	6711.01	8281.83	10305.95	12816.19	15870.80	19530.29	23853.65	28897.68	34717.10

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	636.20	636.20	638.00
STORAGE	723.	723.	1011.
OUTFLOW	0.	0.	940.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
10	638.38	.38	1081.	1710	3.00	41.50	0.00

PLAN 2

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	636.20	636.20	638.00
STORAGE	723.	723.	1011.
OUTFLOW	0.	0.	940.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
10	638.39	.39	1081.	9492.	1.37	42.00	41.50

PLAN 1 STATION REACH1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
10	1710.	623.9	41.50

PLAN 2 STATION REACH1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
10	9492.	629.4	42.00

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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978

END

DATE
FILMED

9-80

DTIC